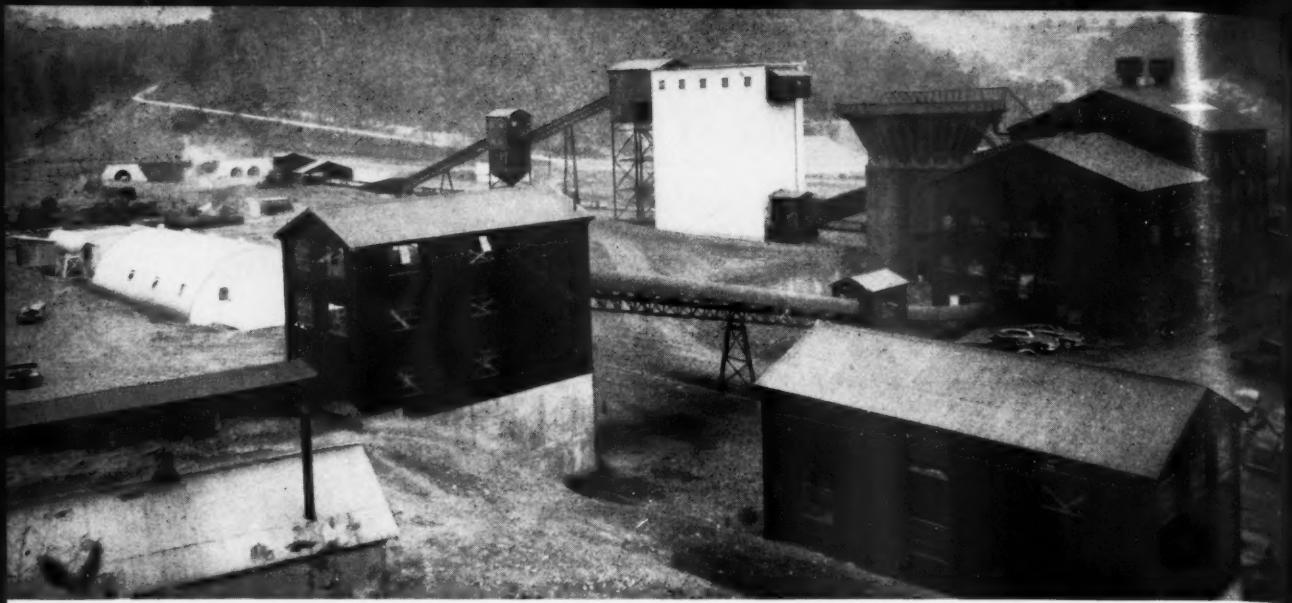


# Mining

CONGRESS JOURNAL





Link-Belt engineered throughout—National Mines' transfer house (left center), washery (top right), blending bins (background).

## LINK-BELT's total responsibility is your assurance of the best in coal preparation

### National Mines gets high-capacity, low cost per ton at Morgantown, W. Va.

TO PRODUCE coal economically from their Morgantown (W. Va.) mine, National Mines Corp. had a dual problem. Not only did they wish to produce a clean metallurgical coal—free of slate, rock and bone—but they also had to move the coal two miles to a river and rail loading station—through rough country—at lowest possible cost per ton.

Link-Belt handled both assignments from start to finish. The new washing and blending plant produces 216 tph of 4" x 0" clean, uniform coal. And the world's longest single belt conveyor carries the coal 10,900 ft. through a tunnel to the river, where Link-Belt also built the barge and rail loading station.

Large or small—Link-Belt accepts total responsibility for complete coal preparation plants. To get all the facts on how this single *proved* source can give you the finest in modern coal preparation—at the lowest over-all cost—call the Link-Belt office near you . . . today.



### COAL PREPARATION and HANDLING EQUIPMENT

LINK-BELT COMPANY: Chicago 9, Philadelphia 40, Pittsburgh 13, Wilkes-Barre, Huntington 9, W. Va., Louisville 2, Denver 2, Kansas City 8, Mo., Cleveland 15, Indianapolis 6, Detroit 4, Birmingham 3, St. Louis 1, Seattle 4, Toronto 8, Springs (South Africa).

13-018

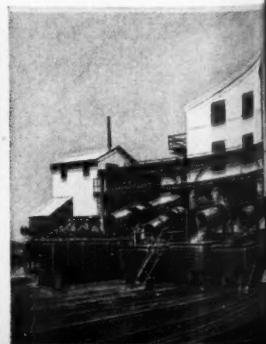
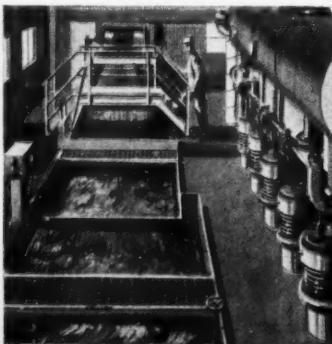
### Here's what LINK-BELT's total responsibility means to you

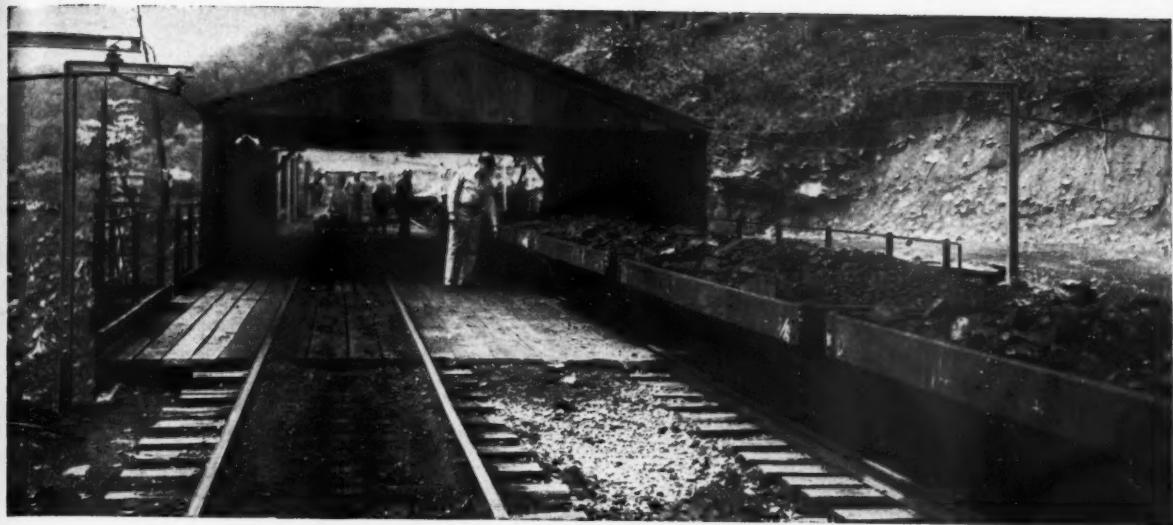
OVERALL ENGINEERING. Vast experience of nation-wide design and field engineering staff integrates all factors, assures expert planning.

QUALITY EQUIPMENT. Link-Belt itself builds a broad line of coal preparation, handling and power transmitting equipment.

COMPLETE ERECTION. Experienced erection superintendents, staffs and skilled crews carry through entire job down to last detail.

SATISFACTORY PERFORMANCE. When you rely on Link-Belt as a single source, Link-Belt accepts responsibility for overall operation.





## RED JACKET'S NO. 17...

### ANOTHER MODERN MINE INSTALLS THE S-D AUTOMATIC HAULAGE SYSTEM FOR MORE EFFICIENT, ECONOMICAL OPERATION

Red Jacket's Modern No. 17 Mine is another typical example of how modern mines are making a major reduction in coal production costs by installing the S-D Automatic Haulage System. At No. 17 this modern haulage system comprises three 15-ton locomotives, 250 S-D "Automatic" Drop Bottom Cars and a 450-ton capacity Surge Bin. Coal and slate cars are often mixed in the same trip of about 20 cars. An average haul from the mine to Surge Bin is about 3 miles.

#### DETAIL INFORMATION ON THE S-D HAULAGE SYSTEM AT NO. 17 MINE NUMBER OF S-D "AUTOMATIC" DROP BOTTOM CARS:

200 16 foot (6 ton capacity) cars for  
transporting coal.  
50 12 foot (4 ton capacity) cars for  
transporting slate.

**Car Wheels:** S-D "Floater" Ball Bearing.  
**Method of Loading Cars:** Mobile loaders to  
Shuttle Cars to Elevating Conveyors to S-D  
"Automatics."

**Average Trip:** 20 cars.

**Average Haul:** 3 miles

**Track Gauge:** 48 inches.

**SURGE BIN CAPACITY:** 450 tons.

**Construction:** Concrete.

**Bin Length:** 52 feet.

**Bin Width:** 25 feet.

**Tracks Over Bin:** Two (Bin loaded by trips  
entering from either direction).

**COAL HANDLED BY THE 250 S-D  
"Automatics":**  
4,000 tons per day.

As each trip approaches the Surge Bin the slate cars are independently emptied at a slate bin. Trip continues non-stop over Surge Bin where coal cars are automatically emptied, then returns back to the mine. This fast, dumping-on-the-move haulage operation saves hundreds of man-hours by eliminating manual dumping. It saves thousands of dollars involved in maintaining expensive rotary dump equipment. It saves hundreds of hours in down-time because, in the S-D System, should a breakdown occur it is not necessary to shut down the whole system until repair is made. In addition, this system reduces mining and cleaning plant operation costs because it permits each to operate independently of the other. One shift operation of the preparation plant is often sufficient to take care of two shift operation of mine. Any cleaning plant works at the least cost with an even continuous supply of coal. The Surge Bin continues to supply coal to preparation plant when, for any cause, there is a delay at the face. Breakdowns or delays at the preparation plant need not stop mine production because the Surge Bin will take the coal until repairs are made.

This continuous supply of coal from the face to the preparation plant, guaranteed by the S-D Automatic Haulage System, is absolutely necessary to produce coal at the lowest possible cost. This system is recognized as the leading method of cutting coal mining costs today! We welcome an inquiry from you. Sanford-Day Iron Works, Inc., Knoxville, Tennessee.

# SANFORD-DAY IRON WORKS

# Why is this the best buy in power conversion equipment?

When Westinghouse delivered this portable Ignitron Rectifier Substation it came complete . . . mounted in three mine cars. There was nothing else to engineer or buy. All the mine did was hook up the end car to the a-c line and take off the d-c at the other end.

### **Unit gives uninterrupted production**

Westinghouse Ignitron units have an unequaled service record in the mining industry. Since 1937 they've racked up a total of 15,000 years of accumulated service. One Western mine reports: "Our experience with a Westinghouse Ignitron Rectifier Substation has been highly satisfactory. The installation is unattended. It cuts out on shorts then cuts back in again. An electrician visits it every two weeks to clean and inspect contact points. There has been no other maintenance cost. We have never had to renew a tube during a million and a half tons of production."

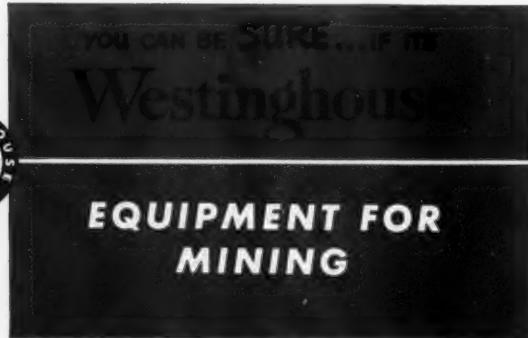
### **Fast Westinghouse service in all locations**

But if they ever should need service, Westinghouse can provide it—FAST. We have repair plants near all mining districts. Renewal tubes and parts are carried in 24 warehouses throughout the country. Highly skilled field engineers are on call at 37 locations. You're *always* near skilled Westinghouse service.

### **Call Westinghouse early on every job**

The Ignitron Rectifier Substation is an outstanding example of Westinghouse developments for the mining industry. We make a *complete* line of electrical equipment for mining service. Next time you need electrical equipment, call your nearby Westinghouse office. Westinghouse Electric Corp., Box 868, Pittsburgh 30, Penna.

J-94924



**They did what you can do  
to produce more**



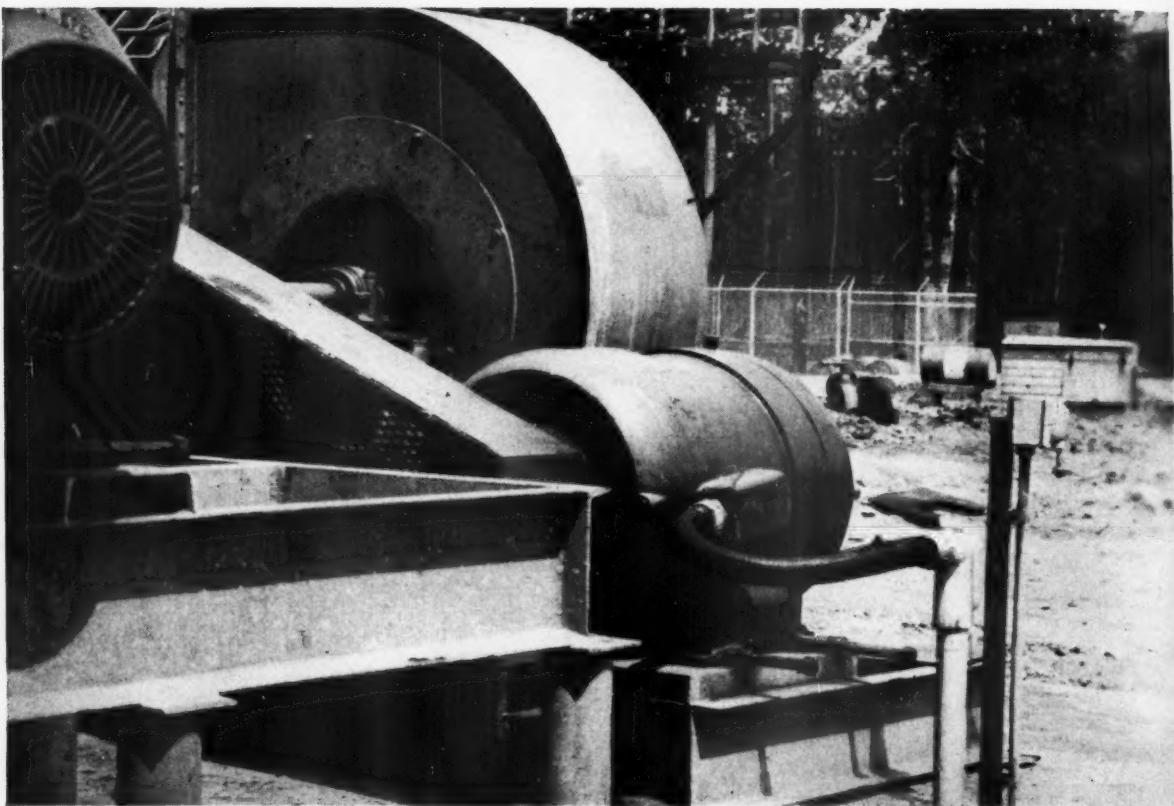
The Westinghouse Ignitron Rectifier Substation is available as a portable unit like that shown above, or in compact stationary cabinets for permanent installations.

"We choose

# SEALTITE

electrical conduit to

isolate vibration and protect against moisture" — J. M. Huber Corp.



**TYPICAL OUTDOOR INSTALLATION** of flexible Sealite electrical conduit at the Huber Carbon Black Plant, Baytown, Texas. Gulf Coast weather, noted for its excessive moisture, necessitates this reliable, liquid-tight conduit.

**IT'S WET IN BAYTOWN, TEXAS.** In this Gulf Coast town, high humidity and heavy precipitation are the rule. Under such conditions outdoor wiring presents a problem at the carbon black plant of the J. M. Huber Corporation. Only a liquid-tight electrical conduit can protect the wiring. At the same time vibration and constant flexing from blower motors must be overcome. Sealite\*, a unique synthetic-jacketed conduit with a *flexible steel core*, meets these demands admirably.

Sealtite is as flexible as garden hose. You can install

it more quickly than rigid conduit. You can cut it easily. You can take it down and move it without trouble. You can use it in cramped quarters or where conduit must either bend or allow for vibration and movement.

Sealtite is available at your Electrical Supply House. It uses standard rigid electrical conduit fittings. For informative Bulletin No. C-201, write to The American Brass Company, American Metal Hose Branch, Waterbury 20, Connecticut. In Canada: The Canadian Fairbanks-Morse Company, Ltd.

\*Trademark 82339

specify

# SEALTITE

AN ANACONDA® PRODUCT

for flexible, liquid-tight electrical conduit—

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VOLUME 38, NUMBER 11

FOR NOVEMBER, 1952

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*Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress*

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## THE AMERICAN MINING CONGRESS

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Member Audit Bureau of Circulation

# JEFFREY

## MOLVEYOR-COLMOL



309-52

96-51

The COLMOL is a continuous mining machine which advances into a solid seam, removing all coal from a minimum area 9½ feet wide by 3 feet high. All machines have a 12" adjustment for height and are available in different heights up to 72".

# THE JEFFREY

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# HAULING SYSTEM

● The MOLVEYOR is comprised of receiving end section, a discharge end and any number of intermediate sections and provides a flexible high productive method of transporting coal from face to main haulageway. Receiving end section can be attached to COLMOL and designed to advance with it—or can be operated from receiving end when not connected with the COLMOL.

Discharge end section delivers coal continuously to belt haulage system.

**15 foot Belt Section**

**Belt motors — 2 H.P.**

**Each unit has an 1/2 H.P. traction motor**

**Can be operated as a complete unit up to  
350 feet — or longer**

**Tramming speed ..... 33 feet per minute**

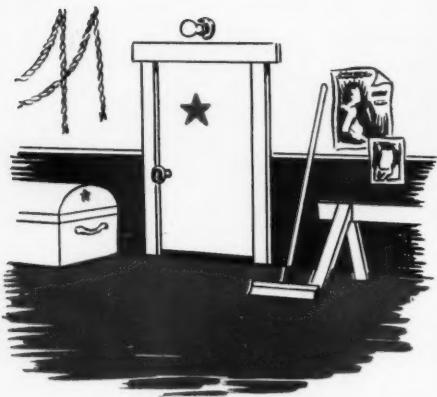
**Belt width ..... 24 inches**

**Belt Speed ..... 300 or 400 feet per minute**

**Capacity ..... 3 or 4 tons per minute**

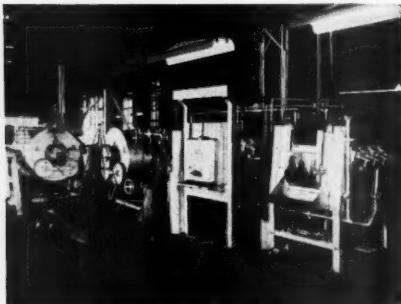
*Contact a Jeffrey Engineer relative to adaptation  
of this system to your mine.*

160-51



# BACKSTAGE at BOWDIL...

... a glimpse behind the scenes to show you WHY Bowdil Products enjoy a reputation as the standard of the coal mining industry.



Latest type tempering, tool-hardening and carburizing furnaces give Bowdil products the right hardness, tensile strength and toughness. Every Bowdil Bit receives the most up-to-date heat treatment . . . for example, natural gas from our mains is first purified by a special generator, and another maintains constantly uniform temperature of quenching oil.

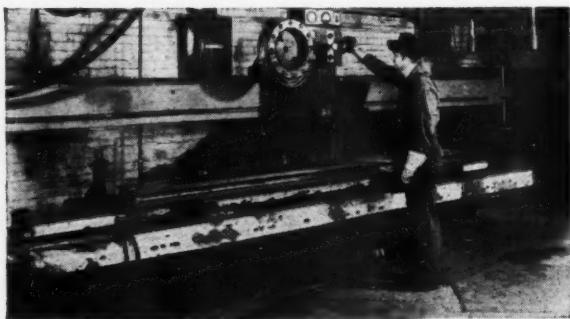
product performance depends on proper heat treating



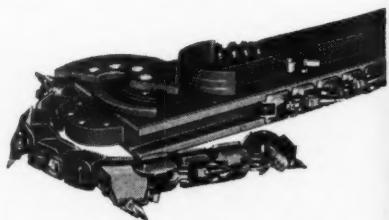
This new grinder, mounted on a floating base in our plant, assures accuracy to .0001" on the parts of Bowdil Chain that take the greatest abuse. Such attention to precision means longer life, trouble free service—results directly in power savings and less down-time for your operation.



our investment in precision pays you dividends



All-welded construction of Bowdil Bars has proved them superior in actual tests made by exerting measured pressure between 3 foot centers . . 4" thick conventional bars tested will bend with 25 to 35 tons pressure—3" thick Bowdil Bars will bend with 60 to 70 tons pressure.



modern welding is your assurance of product strength and durability

*The* **BOWDIL CO.** CANTON, OHIO



*teamwork  
in  
specialties*

## THE BLASTER

CRUCIBLE HOLLOW  
DRILL RODS

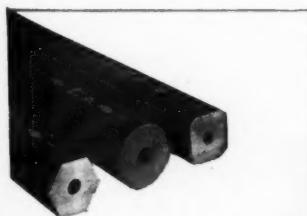
In rock-drilling operations, the blaster is a key man. He plans the blast, tells the drill-runners where to drill their holes, loads the charge for the greatest effectiveness.

He expects . . . and gets . . . peak efficiency from his men and the tools they use.

This is why Crucible Hollow Drill Rods rank first with crews supervised by top-notch blasters. Experience has shown them that Crucible rods stand the rapid-

fire battering of modern rock-drilling longer; give them the least breakage, the greatest service life.

Crucible Hollow Drill Rods are right for the job because they are made by the world's largest producer of *tool and high speed steels*. From this metallurgical experience come the high mechanical properties that have set record after record for least cost per foot drilled. Use Crucible Hollow Drill Rods in all your drilling operations.



**CRUCIBLE**

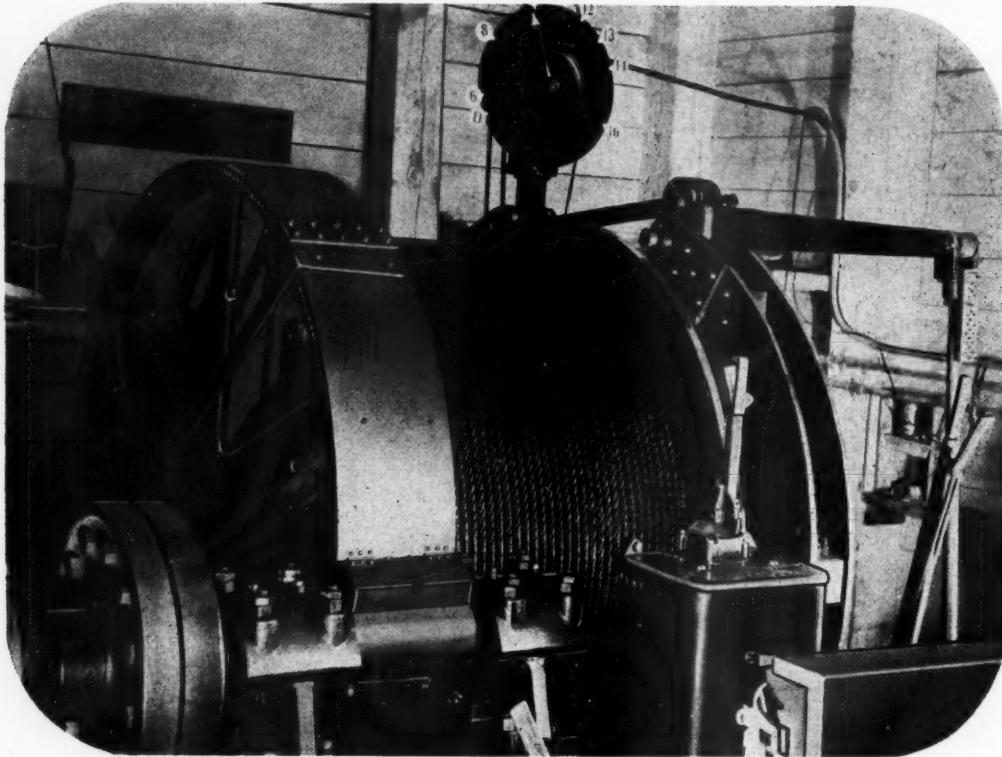
first name in special purpose steels

**HOLLOW DRILL RODS**

52 years of *Fine* steelmaking

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.  
REX HIGH SPEED • TOOL • REZISTAL STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

# WIRE ROPE



**This is the longest-lasting rope  
we've ever made for mining**

JUST MENTION wire rope and most everyone thinks of Roebling. For one thing, Roebling made the first wire rope in America. But what's more, we've always led in developing better wire rope for the needs of every branch of industry.

Roebling Preformed "Blue Center" Steel Wire Rope is today's best bet for mining service. It's

safe, dependable and stands up under rough going. It saves you time and cuts costs.

There's a Roebling wire rope of the right specification for top service on any job. Call on your Roebling Field Man for his recommendations. John A. Roebling's Sons Company, Trenton 2, New Jersey.

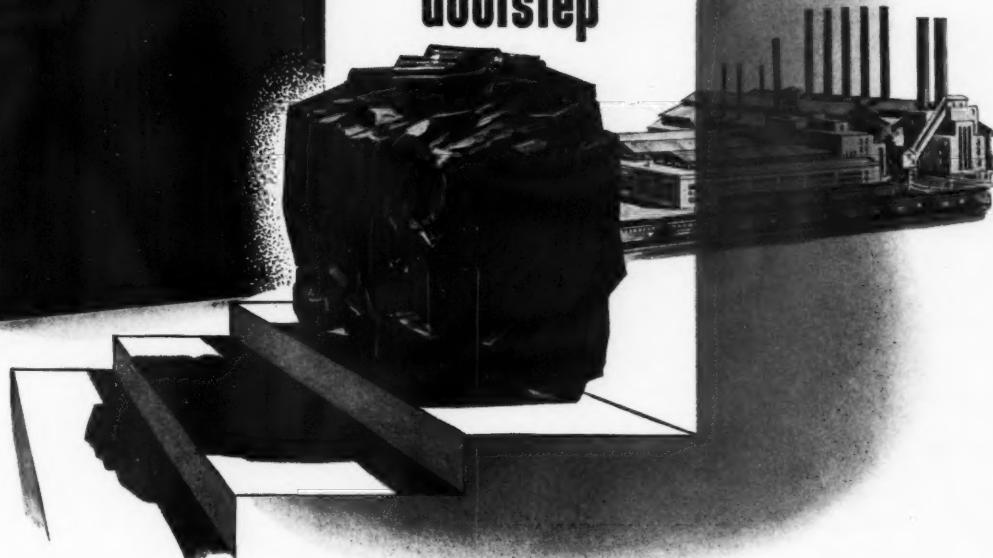
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For low-cost  
**POWER...**

Choose the fuel  
on Industry's  
doorstep



**C**oal is where you find it. Fortunately, however, a large share of the nation's operating Bituminous mines are located in Baltimore & Ohio territory—economically accessible to America's great industrial plants. The Bituminous mined here—practically on Industry's doorstep—is of excellent quality and in wide variety; whatever your specific need, there are B&O coals to meet it. Furthermore, the supply is *inexhaustible*—you can count on an *unlimited* reserve of B&O Bituminous, even in emergencies, for centuries to come.

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**BITUMINOUS COALS  
FOR EVERY PURPOSE**



**BALTIMORE & OHIO RAILROAD**

Constantly doing things—better!

**"That's my  
buddy...that  
Thor is!"**



**Thor** PORTABLE POWER  
**TOOLS**

INDEPENDENT PNEUMATIC TOOL COMPANY

AURORA, ILLINOIS

Top side or under ground, Thor Sinkers or "pluggers" are money-makers... You'll find them No. 1 choice for sinking shafts... used with Thor Sinker legs, they bring tremendous savings in drifting or tunneling costs... for stoping, clamp a Thor Sinker to a Thor Raiser Leg. There are many good reasons why Thor Sinkers are 1st choice with mining engineers, mine operators and the miners themselves. For details, write Independent Pneumatic Tool Co., Aurora, Illinois, or Los Angeles, Calif.

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CONCRETE VIBRATORS • ROCK DRILLS • BACKFILL TAMPERS  
SUMP PUMPS • NAIL DRIVERS • SHEETING DRIVERS  
CEMENT HAMMERS • ELECTRIC HAMMERS AND SAWS**

FACTORY SERVICE BRANCHES IN 20 PRINCIPAL CITIES

[ Page 12 ]

# 43 MARION MACHINES WORK HERE

**MARION POWER SHOVEL CO.**

Whether your work is construction, quarrying,  
coal stripping or mining, you'll want machines  
that stand up year after year in the class of  
heavy-duty service required by this huge  
copper mine.

**MARION, OHIO**  
**3/4 TO 45 CU. YDS.**

# In BELT CONVEYORS JOY

## has what you need

Complete selection of sizes and types to meet any operating condition and requirement underground or above ground

Joy Belt Conveyors—lifelines of the mining industry—furnish capable, low cost transporting systems for gathering, main line or slope work.

Heavy, pan-type sections, 8', 9', 10' or 12' long, are bolted together to form extremely rigid, dependable units. Idler rolls are equipped with either sealed, precision bearings which require no lubrication; or heavy duty, grease-type roller bearings.

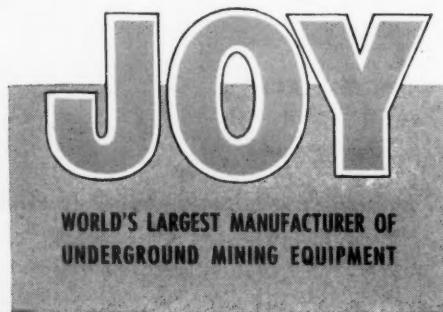
Drive pulleys are covered with vulcanized-rubber lagging for maximum bonding between pulley and lagging. Motors and reducers are correctly matched to power re-

quirements, with ample allowance for the service factor at peak load.

Intermediate sections are produced in a wide range of styles and sizes, some of which are illustrated at right. They're built for maximum strength and portability with minimum weight.

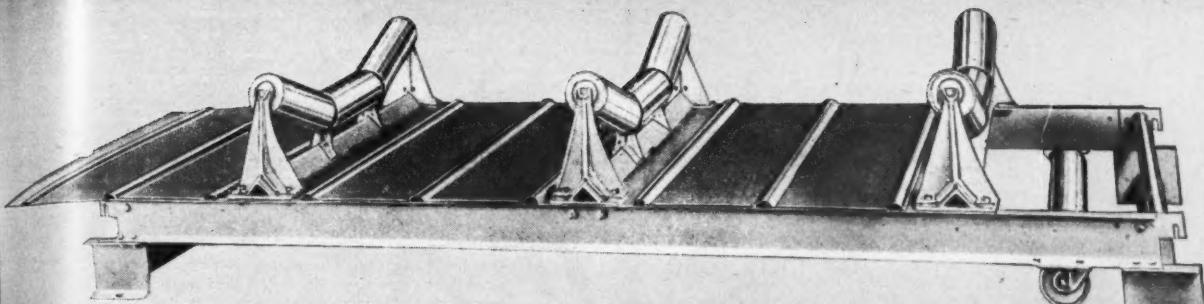
JOY is the world's only manufacturer of *both* tandem-pulley drives and direct-connected, totally-enclosed, single-pulley drives. A Joy Engineer, therefore, can unhesitatingly recommend the proper type of conveyor to fill YOUR needs. • Write for JOY Belt Conveyor Bulletin No. LD-100.

Write our Film Booking Office for Free Showing of "TRACKLESS MINING IN COAL," a 16 mm, full color, sound movie, 45 minutes long.



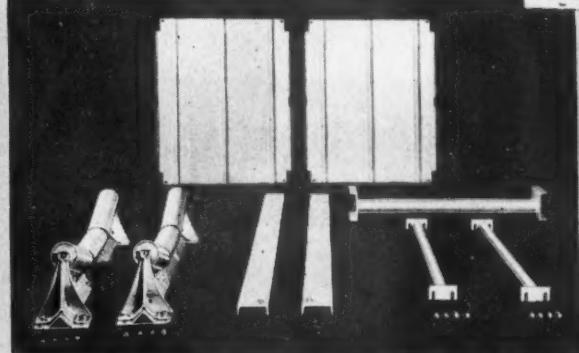
See the JOY Film, "SULMET TUNGSTEN CARBIDE BITS", 16 mm, sound, full color, 12 minutes viewing time. Write our Film Booking Office.





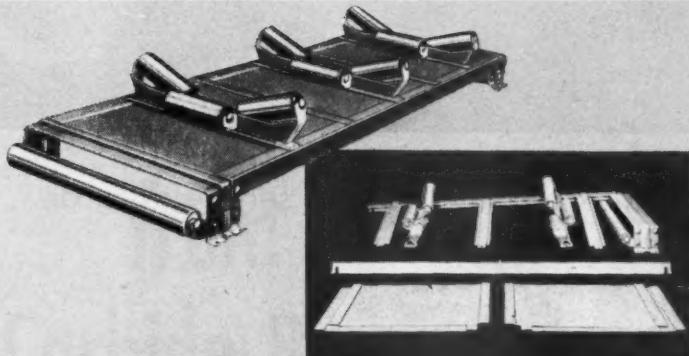
ABOVE: 12' Intermediate Conveyor Section for very heavy duty. Unit is knockdown type, for use with 48" belt. For additional strength, cover sheets are corrugated—stringers are of 6" channel steel. Cross pipe spacers, which drop into place without bolts, rigidly brace the section and hold it in alignment. The cover sheets *lap under* the troughing idler base angles to prevent leakage. Belt idlers have grease-type bearings as standard equipment, but can be furnished with sealed, precision bearings.

RIGHT: 8' Intermediate Conveyor Section, similar in design to above, for use with 42" wide belt. This unit can be knocked down into easily handled pieces, as shown, for easy transportation.



RIGHT: 9' Intermediate Conveyor Section of knockdown design. Can be furnished for 26-30-36-or-42" belts. Belt idlers have sealed, precision bearings. Cradle is heavy, die-formed, ribbed pressed steel. This is a heavy duty unit of minimum height—15  $\frac{3}{4}$ " to 18  $\frac{3}{4}$ "—for use in thin-seam mining.

RIGHT, BELOW: Similar style in 8' length. Note that the only bolts used in joining are those which anchor the troughing idler brackets to the side rails.



ABOVE: Standard 8' one-piece, channel-type Intermediate Section for limited tonnages. 3", 4", or 5" channels. Sections are self-contained with cross pipe-spacers welded between channels. Pivotal section connection. Section connection made without bolts or loose parts of any kind.

LEFT: Three 9' sections joined together. Each is of one-piece, welded construction. Side rails are 5" steel channels. Ribbed pressed steel cradle. Pivotal section connections. For 30", 36" (illustrated), or 42" belts.

*Consult a Joy Engineer*

W&D CL4197

**JOY MANUFACTURING COMPANY**

GENERAL OFFICES: HENRY W. OLIVER BUILDING • PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

**Buy Safe! Don't gamble**  
on just any shuttle car cable—  
you may lose



One break is trouble enough. Frequent breaks prove your cable faulty. Down time and repair losses soon mount higher than original cable costs. It's just common sense to buy the best in the beginning.



for longer "break-free" service insist on



This is Anaconda Securityflex Shuttle Car Cable. Note patented breaker strip and D-shaped insulation to prevent overriding. No other cable offers these plus features.

### **Cold Rubber Insulated Securityflex**

Almost any cable looks good when new. It's *service* that counts. ANACONDA Securityflex\* portable power cable serves well through many, many hours of tough, rough use. There's a good reason why.

Cold rubber insulation — an ANACONDA First — is 50% more resistant to moisture than regular rubber. Special-strength neoprene jacket takes abrasion, heat, rockfall, and run-overs in stride where other types fail.

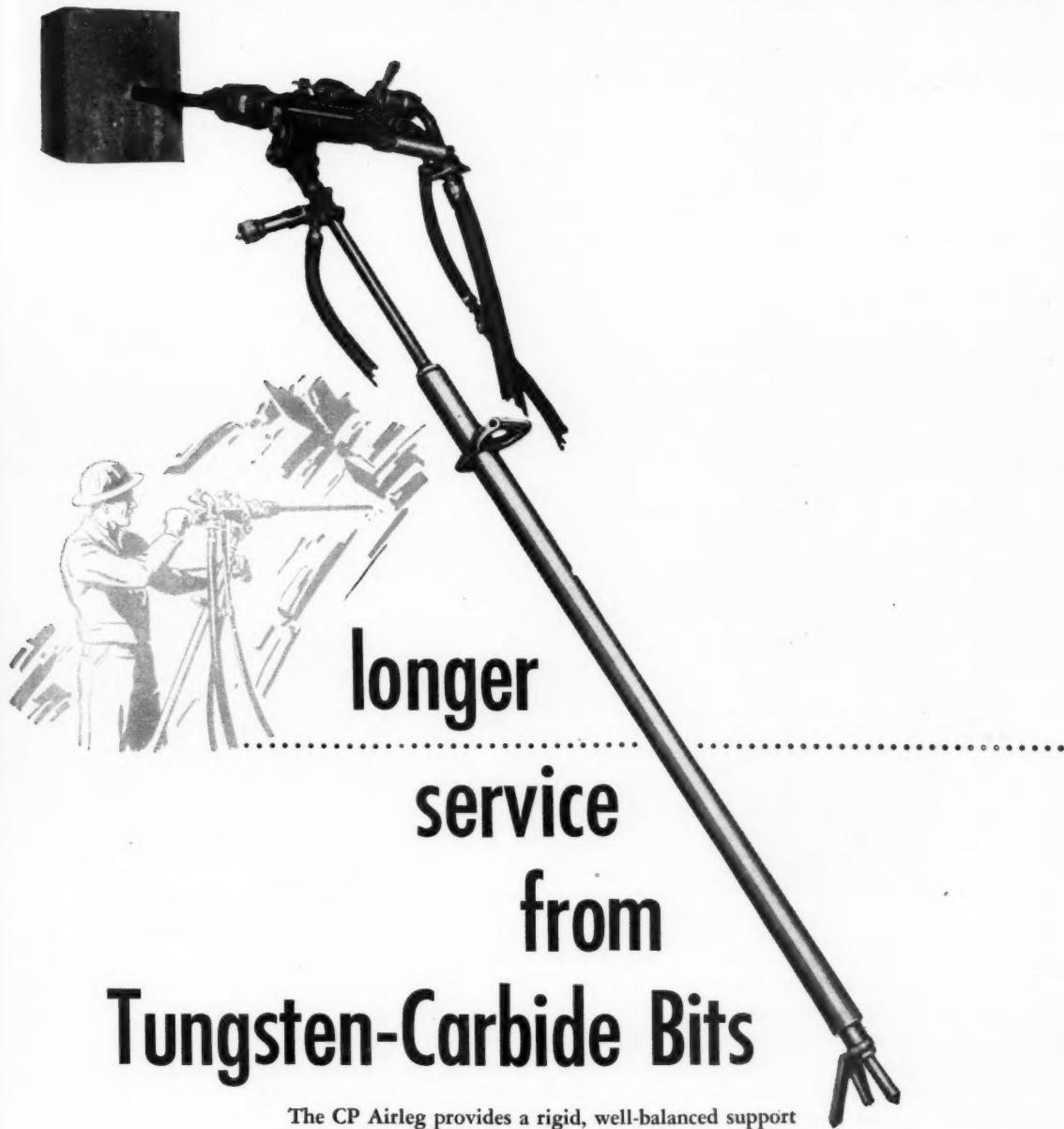
Securityflex functions nicely. Under reel tension, over guides, and in frequent sharp bends, it doesn't fatigue readily. It won't override, kink, or twist.

This ANACONDA Cable is safe—a look at the patented "anti-short" breaker strip and D-shaped insulation tells why. This is *plus* protection.

Write your nearest Anaconda Sales Office or Distributor for more information. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

\*Trademark 52361

**the right cable for the job** **ANACONDA**<sup>®</sup> **wire and cable**



longer  
service  
from  
**Tungsten-Carbide Bits**

The CP Airleg provides a rigid, well-balanced support for the drill and effectively absorbs all recoil. A CP ratchet throttle (exclusive) maintains balanced feed leg pressure and keeps the bit in constant contact with the rock. This fine balance of feed pressure prevents "slapping," and minimizes the danger of fracturing tungsten-carbide bits.

Available in 1 7/8" and 2 1/8" feed cylinder diameters, and with 36" and 48" feed travel, the Airleg is ideal for use with CP Sinkers, particularly the general utility, 45 lb. class CP-32 and the 55 lb. class CP-59.

Write for detailed information.



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ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

 *50th*  
ANNIVERSARY

**My Sweetheart's No Longer "A Mule in The Mine" . . .**



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RELIANCE  
TYPE 'T' HEAVY DUTY**

*"The Toughest  
Motor Ever Built!"*

*Reliance Totally-enclosed, Non-ventilated,  
Explosion-proof Motor; one of several Reliance motor  
types especially developed for the mining industry.*

Wise operators nowadays provide their miners with dependable, economical Reliance Type 'T' Heavy Duty Motors. These rugged motors power 95% of all rubber-tired underground haulage . . . 70% of all coal loaders . . . and increasing numbers of other underground machines performing the toughest jobs in mining.

Type 'T' motors embody refinements developed by Reliance engineers working closely with users in the application of thousands of motors to the coal-mining industry. Especially designed, electrically and mechanically, for difficult underground jobs, Reliance motors have vital parts thoroughly protected against coal dust, moisture and other hazards encountered in the toughest mining jobs. They stay clean and dry . . . last longer with less maintenance.

The result . . . you enjoy exceptional freedom from tonnage losses due to motor failures.

Reliance Type 'T' Motors are available in ratings from  $\frac{1}{4}$  to 100 hp. to meet standards of the Bureau of Mines for use on "permissible" equipment. Low height and compact design satisfy space limitations of underground applications.

Next time you order new equipment, specify Reliance. See for yourself how these *tough* motors keep production up . . . and costs down.

*Write for Bulletin C-2001 describing the complete line of Reliance Type 'T' Motors through 1000 hp.*



**RELIANCE**

**ELECTRIC AND  
ENGINEERING CO.**

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SAVE MONEY

ON EVERY TRIP

YOUR SCRAPER MAKES

# WITH THE GARDNER-DENVER AIRSLUSHER

## HERE'S HOW:

**Steady power**—for a full pay load every trip.

**High speed**—for more trips per shift.

**No air-waste idling** between trips.

**Single throttle control**—readily mastered by your  
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**Three sizes**—to fit your scraper capacity  
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Airlushers and Air Hoists.

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Develop full speed and  
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Compact and lightweight for  
easy moving about under-  
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THE QUALITY LEADER IN COMMERCIAL AIR MOTORS AND AIR COMPRESSORS

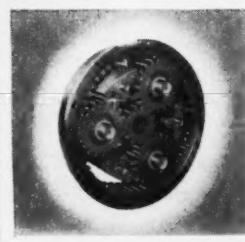
**NEW way to step up hauling . . .**

## **STERLING-WHITE 22-TON**

### **PLAN-A-POWER ROCK MOVER**

**IT'S NEW! It's rugged and tough!  
And it's built right to *your* needs.**

The famous Super-Traction Differential reduces wheel spinning and bogging down . . . greatly increases tire life. Every feature right for more work . . . more power . . . lower operating cost.



#### **Get More Work Done with Sterling-White Plan-a-Power**

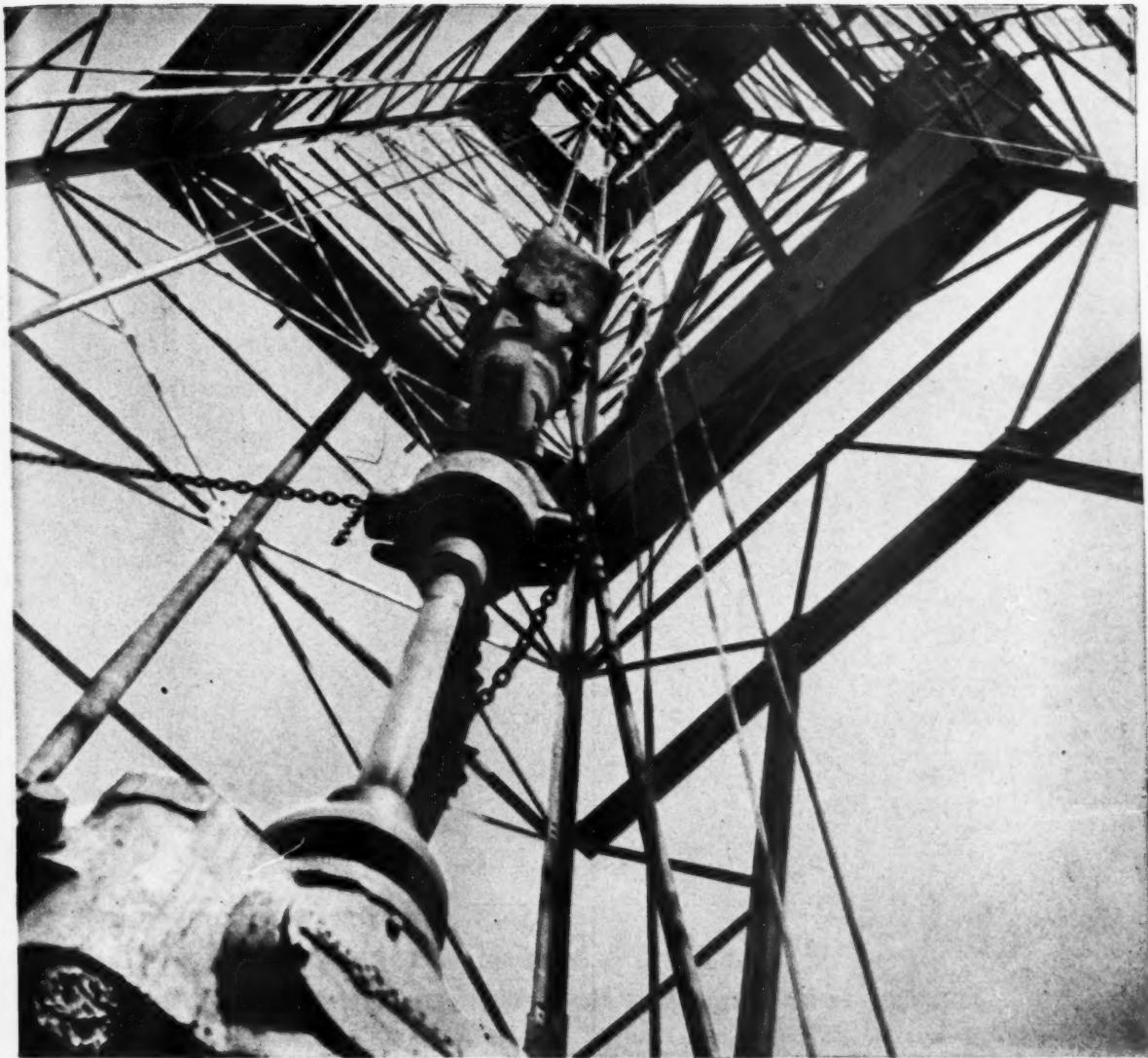
Wheel spinning and slippage reduced to a minimum. Job-engineered super-traction differential divides power to each rear axle exactly as road and load conditions demand. Plan-a-Power rugged design has plenty of traction and power to MOVE and to LAST!

#### **Engineered for the Exact Needs of the MINING INDUSTRY**

- 22 ton payload, 15 cu. yd. capacity
- 300 H. P. supercharged diesel engine
- Ten-speed transmission, wide ratio range
- Sterling-White Plan-a-Power rear axle. Single reduction carrier with final reduction in wheel hubs through tri-planet gears
- Hydraulic power steering gear, short wheelbase, for outstanding maneuverability, ease of operation
- Offset cab, extra wide, all-steel and rugged



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... Cores  
Tell  
The Story

with speed and economy is provided by Longyear Contract Drilling Service. Rapid drilling progress is obtained by modern equipment like this new Longyear deep hole drill. Maximum core recovery is assured by skilled Longyear crews experienced in recovering cores from all types of formations. Whatever your drilling needs—deep hole or shallow with a "turn-key" job—Longyear Contract Drilling Service will satisfy them quickly and economically. Write today for complete information without obligation.

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The Longyear DH-5 deep hole drilling rig is now available to purchasers who prefer to do their own drilling. Write for New Bulletin.

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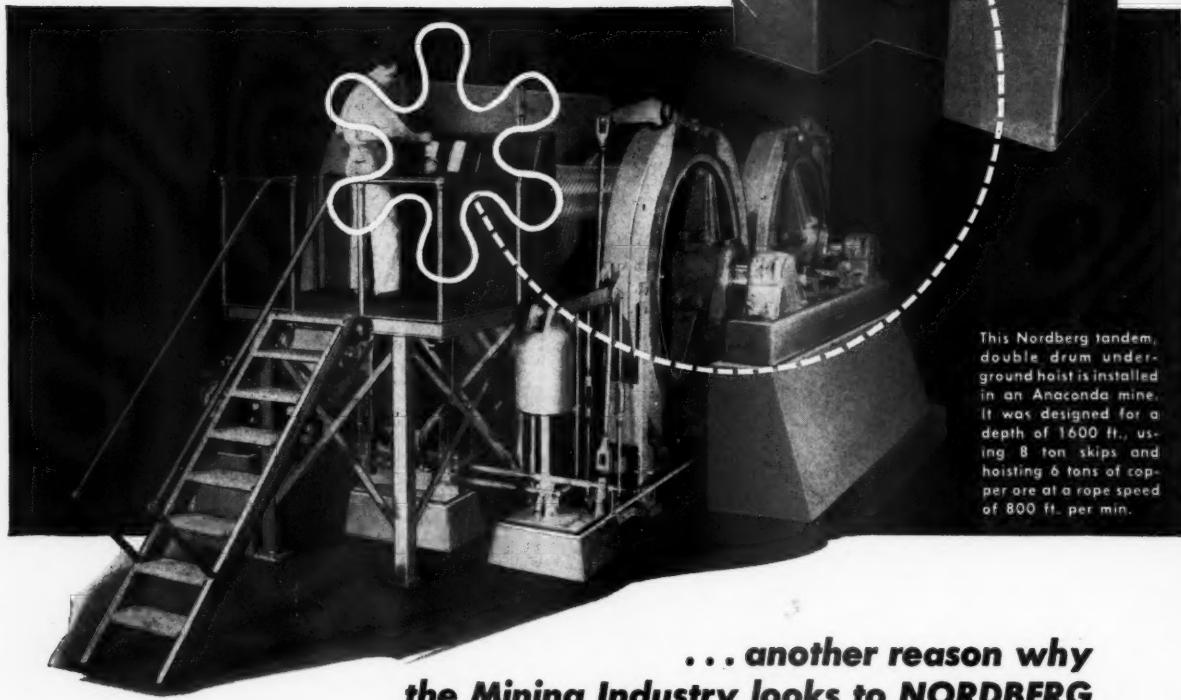
CANADIAN LONGYEAR, LIMITED, NORTH BAY, ONTARIO, CANADA

DIAMOND CORE DRILLS • CONTRACT CORE DRILLING  
SHAFT SINKING • GEOLOGICAL INVESTIGATIONS

# MICROMETER DEPTH INDICATORS in the Console...



(Nordberg Patent)



This Nordberg tandem, double drum underground hoist is installed in an Anaconda mine. It was designed for a depth of 1600 ft., using 8 ton skips and hoisting 6 tons of copper ore at a rope speed of 800 ft. per min.

... another reason why  
the Mining Industry looks to NORDBERG  
as the leader in Mine Hoist design and development

• SINCE 1895, Nordberg has enjoyed worldwide leadership in the hoist field, specializing in building large or unusual hoists . . . and has been the source of the most progressive hoist engineering advances in the mining industry.

*Micrometer Depth Indicators in the Console*, for example, is just one of the advanced engineering features that has made Nordberg the leader in the design and development of modern mine hoists. This, and many other

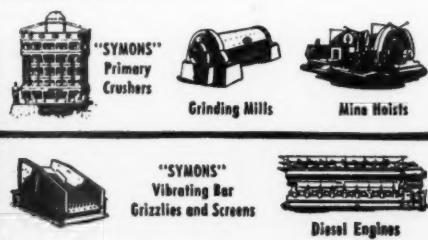
important engineering refinements, assures the very best in workmanship and materials to give you the ease of operation, safety and dependability which has made Nordberg Mine Hoists the standard for comparison.

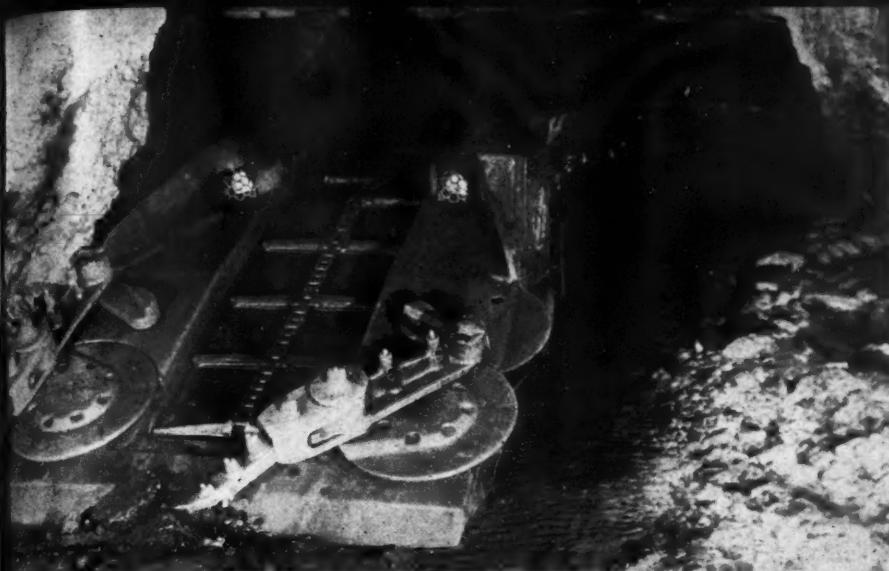
No matter what your hoisting requirements may be, you will find that Nordberg hoist engineers are fully qualified to solve your specific problems. Write for further details, or send for Bulletin 190.

M552

**NORDBERG MFG. CO., Milwaukee, Wis.**

"SYMONS" . . . a Nordberg trademark known throughout the world





*What's your  
problem?*



**H. Dillingham** of Standard Oil's Evansville, Indiana, office, helped this midwest mine use SUPERLA Mine Lubricants to good advantage. He was close at hand, gave operators engineering service when they needed it.

There's a corps of Standard Oil lubrication specialists throughout the Midwest. You'll find one located near your mine. Through special training and a lot of practical experience, this man has gained a working knowledge of lubrication that can mean real savings for you. To obtain his services, simply contact the nearest Standard Oil office. Discuss with him the savings you can make with such outstanding products as:

## Here's versatile lubrication, plus!

• At a midwest mine, two grades of SUPERLA Mine Lubricants not only have handled successfully a wide variety of jobs but have proved superior in each application to special products previously used.

SUPERLA Mine Lubricant No. 00 has served for over three years in the gear cases and hydraulics of the mine's loaders. Despite hard operation of these machines, there have been no clutch failures, and clutch plates have remained free from carbon deposits. There have been no bearing failures. Hydraulic units have operated efficiently with no downtime for maintenance.

SUPERLA Mine Lubricant No. 4 has been used for over three years in loader gathering heads. On this punishing job, it has prevented any trouble caused by lubricant deterioration or breakdown. Bearing wear has been kept to a minimum.

Shuttle car lubrication and service in a roof bolting drill are among the uses of SUPERLA Mine Lubricants in this mine. The versatility of these products has simplified lubrication and the stocking of

**SUPERLA**  
REG. U. S. PAT. OFF.  
**Mine Lubricants**

lubricants. It has eliminated the costly use of special-purpose oils and greases.

You'll find among the six grades of SUPERLA Mine Lubricants the right combination for successful lubrication of your loaders, cutting machines, shuttle cars, and related equipment. The Standard Oil lubrication specialist in your section of the Midwest will help you get the best possible results. You can contact him through your local Standard Oil Company (Indiana) office. Or write: Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Illinois.

**STANOIL Industrial Oils**... Here's one line of oils that provides cleaner operation of loader and crane hydraulic units; supplies effective lubrication in compressors, gear cases, and circulating systems. One or two grades can replace a wide variety of special oils and lubricants.

**CALUMET Viscous Lubricants**... On open gears and wire ropes, these greases strongly resist washing and throw-off. Their superior wetting ability affords better coating of gears and better internal lubrication of wire rope.

**STANDARD OIL COMPANY**

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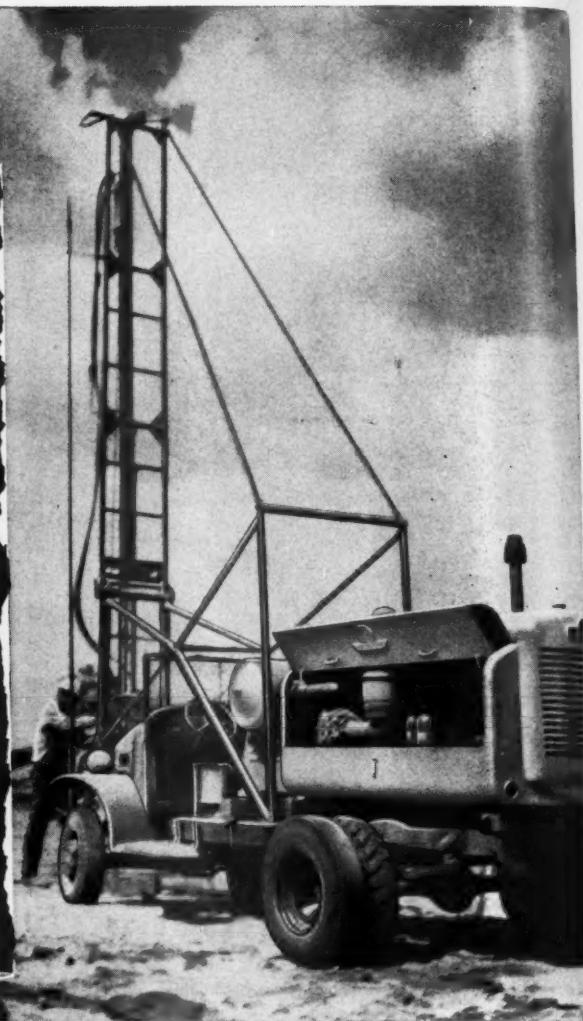
(Indiana)



DR34 feed and H23DR drill mounted on truck chassis.  
Note that Le Roi-AIRMASTER compressor is also mounted  
on chassis, to supply plenty of low-cost air.

**DRILLS  
9,000 FT.**

*-replaces  
only 2  
riflemats!*



**Uranium operation gets remarkable performance from  
LE ROI-CLEVELAND AIR FEED and H23DR DRILL**

**H**OLES as deep as 120 feet drilled with sufficient air for hole cleaning! 18 feet of hole in 12 to 14 minutes, with 90 to 95 psi air pressure. Mister, that's real drilling! And it's typical of the money-making performance you get with Le Roi-CLEVELAND rock drills.

The DR34 air-feed shell provides a 21' feed with 20' steel change. The drill is a Le Roi-CLEVELAND 80-lb. H23DR with 5/16" blowing, strong rotation, positive valve action, plenty of wallop, and dependable durability. Chuck size is standard — 1" hex, 4-1/4" shank.

Octagon or round-lug shanks can be used, also.

Though 120' holes have been sunk in uranium-prospect drilling operations — using jointed steels and standard forged steel-type detachable bits with stellited corners — average drilling depth with the DR34 for blast holes is 40' to 50', depending on the contour of the terrain.

On deep-hole work, enjoy more footage per shift — do your drilling better, faster, for less — with Le Roi-CLEVELAND machines.

Write today for complete information.



**LE ROI COMPANY**

RD-46

**CLEVELAND ROCK DRILL DIVISION**  
12500 Berea Road, Cleveland 11, Ohio  
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## DESLIMING Ahead of FROTH FLOTATION with *H + P* CYCLONE THICKENERS

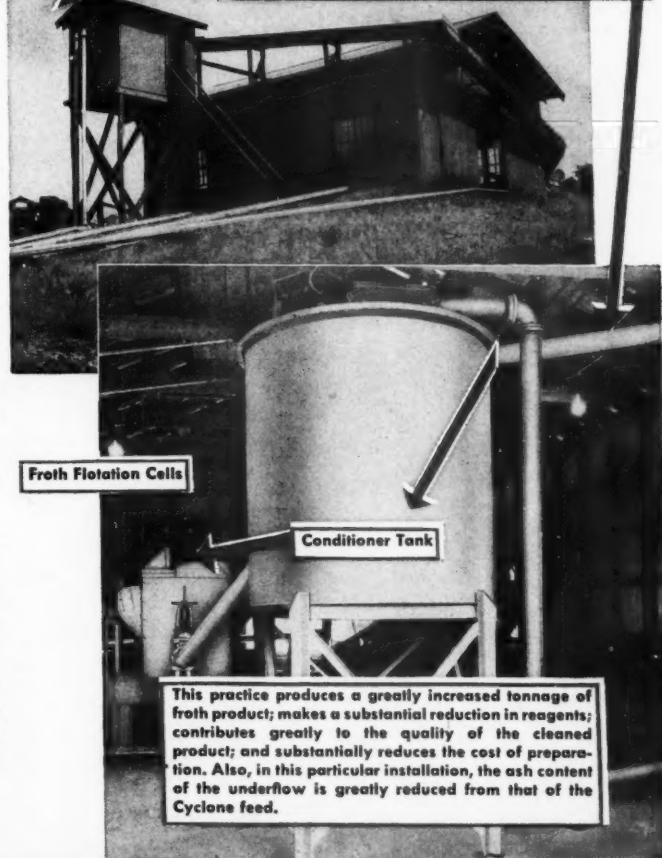
Increases Froth Product and Reduces Preparation Costs

At DeBardeleben Coal Corp., Empire, Alabama, the normally-wasted sludge from the coal cleaning plant is pumped to a battery of four 14" H & P Cyclone Thickeners where 1200 gpm is thickened and deslimed at approximately 325 mesh. The overflow is discarded as refuse and the deslimed underflow is sent to a conditioner tank and then to the froth flotation cells.

The use of Heyl & Patterson Cyclone Thickeners by the DeBardeleben Coal Corporation at Empire, Alabama for desliming ahead of froth flotation marks another successful application of this versatile equipment in the mining and preparation fields.

H & P Cyclone Thickener equipment is a proven means of controlling solids in circulating systems and separating solids from liquids. H & P Cyclones also provide an economical and practical answer to Classification and Thickening problems.

Heyl & Patterson laboratory and field tests have provided a sound basis for predicting accurately the Cyclone performance on most feeds. For more information send for Booklet 5-CT-51 or send us your problem and we will tell you how an H & P Cyclone application can provide the answer.



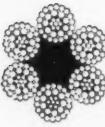
Cyclone Thickeners  
Thermal Dryers  
The Drying Dutchman  
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Thorsten Coal  
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Rotary Mine Car Dampers  
Coal Crushers  
Coal Preparation Plants  
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*Heyl + Patterson, Inc.*  
"SINCE 1887"

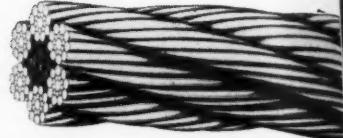
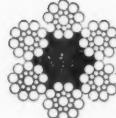
55 WATER STREET • PITTSBURGH 22 PA

# The Proper Rope

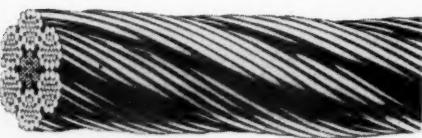
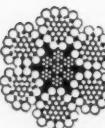
Plus Pr



**TO COMBAT FATIGUE** Tiger Brand 6x37—Type S Excellay Preformed. This rope is listed as "Special Flexible Hoisting Rope" and is also known as "Crane Rope." It is the most flexible of standard constructions which permits its use with small sheaves and drums. Its reserve strength is highest of the standard constructions.

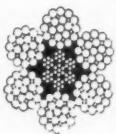


**TO COMBAT ABRASION** American Tiger Brand 6x19 Seale Patent Excellay Monitor Preformed Wire Rope offers greater resistance than regular hoisting ropes because of the large, uniform wire diameters of the outside wires in each strand. Lang Lay construction also increases the resistance by a better distribution of the wear over a greater length of the outer wires.



**FOR RESISTING CRUSHING**, the introduction of a steel core instead of regular fiber core in the various types of ropes, minimizes the harmful effect of crushing and maintains the intended position of all strands in the rope.

The section of American Tiger Brand 6x30 Type G Excellay Flattened Strand Lang Lay with I.W.R.C. as shown, combines the features of increased strength because of the large metallic area, greater distribution of wear on the outside wires, resistance to crushing of the core and flexibility because of the type of rope itself.



**THE "OLD WORKHORSE"** Tiger Brand 6x19 Type N Excellay Preformed Standard Hoisting Rope is more widely used in a greater variety of applications than any other type. It has a superior combination of qualities—good resistance to abrasion and fatigue, high strength and long life. With wire core it has 7½ percent greater strength than with fiber core.



More than a million tons of oyster shells have been converted into chemicals at this plant. The owners have found that Tiger Brand Wire Rope stands up best under these severe abrasive conditions, cutting rope costs, reducing down time and keeping equipment at top capacity.



The slings the thing, especially when you are handling heavy lifts such as the machinery shown here. And Tiger Wire Rope Slings are designed to handle all jobs promptly, safely and economically. They are made of the toughest, strongest wire rope manufactured, and come in many types. Write for our book, "American Tiger Wire Rope Slings."

# Proper Maintenance

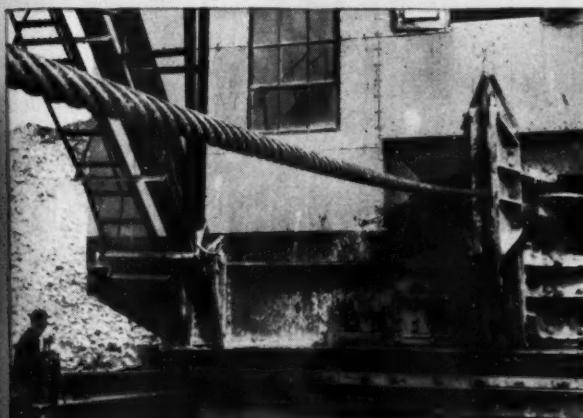
## *Equals* Longer Rope Life Lower Rope Costs

Many prominent users of wire rope have found they can reduce wire rope costs as much as 50% by using a wire rope designed for the job. They get better rope service at lower rope cost by following this simple, job-tested system, with the help of the Tiger Brand Wire Rope Specialist.

Let this qualified expert make *sure* that you select, for each job, a wire rope that is strong enough to carry the load with an ample margin of safety . . . able to stand incessant flexing and sharp bending without failure of wires due to fatigue . . . built to take the most severe abrasion and crushing. Then make sure that every foot of wire rope you own is inspected, cleaned and lubricated *regularly*.

Engineers and contractors who follow this procedure tell us that they are getting twice—sometimes three times—the life they expected from Tiger Brand Wire Rope, plus greater safety for crews and equipment and freedom from rope-caused work stoppages, all of which means important money savings.

When you are in the market for wire rope, make full use of the engineering knowledge of an expert who has made a life-work of analyzing and solving wire rope problems. Just drop us a line and your Tiger Brand Wire Rope Specialist will be glad to consult with you. Meanwhile, why not send in the convenient coupon for a copy of our latest book?



This new Tiger Brand Drag Line Rope was designed especially to resist the extremely severe operating conditions encountered in this class of service. On one job where ropes lasted an average of 600 hours, this Tiger Brand Drag Line Rope was still going strong after 1100 hours—believe it or not!

### Send for This NEW BOOK.

It contains specification data that will help you select the right rope for each application. In descriptive text, illustrations, diagrams and tables, it gives you complete information on types of rope, diameters, working loads and safety factors for all sorts of rope service.



American Steel & Wire  
Rockefeller Building, Dept. N-11  
Cleveland 18, Ohio

Please send me your new book,  
"Specification Data, Tiger Brand Wire Rope."

Name \_\_\_\_\_

Company \_\_\_\_\_

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#### AMERICAN STEEL & WIRE DIVISION

UNITED STATES STEEL COMPANY, GENERAL OFFICES: CLEVELAND, OHIO

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UNITED STATES STEEL EXPORT COMPANY, NEW YORK



## U·S·S AMERICAN TIGER BRAND WIRE ROPE

*Excellay Preformed*

UNITED STATES STEEL

# McCarthy Drills

## CUT DRILLING COSTS!

### BLAST HOLE DRILLS

Extra heavy-duty units compactly designed bore blast holes faster with less effort because of greater power and finger-tip hydraulic feed.

Choice of gasoline, diesel or electric power units drive interlocking-auger sections to any required depths through shale, sandrock, soft limestone and other earth formations.

Vertical and horizontal models are built for individual or cluster mountings on all types of mobile equipment. And there's a highly maneuverable, self-propelled unit specially designed for "close in" horizontal drilling.

Write now for full information on how these rugged work horses can help you hit pay dirt faster.

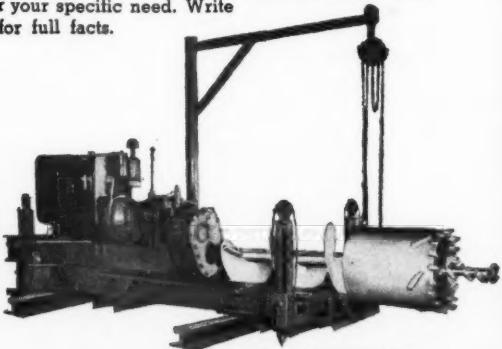


Model 106 Vertical Drill

*Heavy  
Rugged  
Powerful*

### COAL RECOVERY DRILLS

- McCarthy Coal Drills bite into the seam's heart to pull out clean, valuable lump or slack coal with minimum effort, minimum cost.
- Near Salineville, Ohio three men use one machine with 24-inch diameter augers to produce 90 tons of coal daily. At Germano, Ohio the same number of men use 36-inch diameter augers to produce 167 tons per day!
- The rugged McCarthy Mineral Recovery Drills produce coal at \$1.50 to \$2.00 per ton, including amortization of investment cost. These hydraulically controlled units operate on gasoline, diesel or electric power.
- Choose from 4 models. 4 to 24-ft. interlocking-auger sections are available in 20, 24, 30, 36, 42 and 48-inch diameters. Jacks are power operated.
- McCarthy dealers can show you many testimonials or installations and help you make the most profitable selection for your specific need. Write today for full facts.



36" Coal Recovery Drill



MANUFACTURED BY

SALEM

THE SALEM TOOL CO.

## Editorials

JOHN C. FOX, *Editor*

NOVEMBER, 1952

### End of An Era?

PHILIP MURRAY, the immigrant coal miner from Scotland who rose to head one of the world's greatest labor organizations, has passed away. Thousands mourn the passing of the soft-voiced former president of the CIO and United Steelworkers Union.

Though at times his stubbornness overcame his innate Scot's canniness, the rank and file of all labor unions have cause to remember him with kindness. His passing leaves a gaping hole among the labor leaders of today. Who will take his place at the helm?

Phil Murray saw the pendulum swing way past the midpoint where labor and management could sit down, lay their cards on the bargaining table and come to a compromise agreement without the intervention of a third party. He saw the labor movement grow from small beginnings to the point where the Congress of the United States found it necessary to pass legislation to protect the nation from crippling strikes. He saw a strike of such proportions that it almost precipitated a dictatorship on this free nation.

Undoubtedly there are several men who aspire to the post he left vacant. It is to be hoped that his successor, whoever he may be, will not become drunk with the power suddenly placed in his hands. It is to be hoped that he will handle himself with the statesmanship that marked most of Philip Murray's career, and temper his power with wisdom.

The recent election showed that in spite of all union management's efforts through direct contributions to campaign funds, through espousing the cause of one candidate against another—the rank and file apparently lined up with the rest of America and voted independently as free men and women should. Let Phil Murray's successor take heed; perhaps the pendulum has reached the end of its swing and we can look forward to a long era during which true collective bargaining can once more be the rule, when temperate demands can be peacefully satisfied. The time may be near when table thumping and autocratic demands will no longer be in style.

Divine Providence has a way of removing us from the mortal sphere when our work is done. That it is done is not always apparent to those left behind. Perhaps the passing of Philip Murray marks the passing of an era. Time alone will tell.



It is in this kind of topography that Clinchfield Coal Corp. is operating

# Aerial Survey Helps Clinchfield Double Production in Virginia

**Flying Map Makers Help This Coal Company Raise**

**Output from 10,000 TPD to 20,000 TPD**

By **A. E. FLOWERS**

Formerly Chief Engineer  
Clinchfield Coal Corp.

GREAT demand for coal and the necessity for rapid expansion of mining facilities led the Clinchfield Coal Corp., Dante, Va., to aerial surveying as an aid in developing new areas. In 1945 Clinchfield Coal began making plans for expanding their Virginia productive capacity from 10,000 tpd to 20,000 tpd. To do this as quickly as possible, management decided to strip mine the Clintwood seam immediately prior to opening a deep mine. This would serve a two-fold purpose; production would be available almost immediately and valuable information regarding mining conditions to be expected when underground operations began, would be available prior to actual deep mining.

Before making a decision to begin stripping operations it was necessary to evaluate the entire strip-mining potentials. Included in this evaluation were such problems as: type of over-

burden, coal thickness, partings in the coal seam, coal analysis, ratio of overburden to coal, type of equipment applicable to strip-mining the Clintwood Seam, estimated strip-mining cost, estimated deep-mining cost. The first four of these items could be obtained through diamond core drilling and analysis of the cores; the rest could be obtained through knowledge of the topography combined with information obtained from the boreholes.

## Information Needed Quickly

In any strip-mining operation it is of prime importance that the mining company have basic information regarding the topography so that equipment selections may be made intelligently. In a period of rapid expansion with a shortage of trained engineering personnel it was an impossible task to obtain field data and

prepare the necessary maps in the time allowed. In addition, the cost would have been prohibitive. Hence, Clinchfield Coal Corp. turned to aerial surveying as a modern, rapid, accurate and economical method for obtaining necessary data and maps.

An aerial survey is a complete process demanding precise control of every phase of the project. For this reason it is necessary to work very closely with the aerial survey contracting firm from the preliminary planning stage to the final survey plan. Conferences were held with technical representatives of the Clinchfield Coal Corp. and the aerial surveying organization present. The problems to be discussed and solved were:

(1) Determine the area to be mapped. This can best be done by use of a U. S. Geological Survey sheet or combination of sheets and then drawing the outline of the desired area on the sheet. The map should indicate the accessibility of the area through roads and trails; and should also indicate areas of deciduous timber and evergreen timber, showing the outlines of the areas where possible.

(2) Establish sufficient survey control in the form of ground surveys, triangulation stations and level controls if none exist. Clinchfield was fortunate in this respect because an

accurate and extensive system of survey and elevation control had been established shortly after the company was formed. This system is tied into the U. S. G. S. system of control. All property lines and mine workings are tied into this triangulation system; hence, satisfactory control for an aerial survey was already established.

(3) Select the preferred scale and contour interval. It was decided to use a scale of one in. = 200 ft which would give sufficient detail and not be too bulky for field use; a contour interval of five ft was decided to be the best application for the company needs.

The foregoing item furnished the information necessary for the aerial surveying organization to begin actual field work. The coal company engineering department then decided on the sheet layout of the survey. A sheet 30 in. by 40 in. covering an area of 1101.93 acres, was selected as the size best suited to Clinchfield's needs, primarily because it was the same size as standard mine and property tracings.

### Stripping Plans Made

Upon completion of the survey and after the maps and tracings were made the coal company was able to attack the problem of whether it was economically possible to strip mine the Clintwood seam and, if so, what type of equipment would be applicable to the job. In estimating ratio of overburden to coal, across sections were constructed from the contour sheets, volumes calculated, then estimated stripping ratios determined. With all possible data assembled and evaluated, it was possible to proceed with the selection of stripping equipment. Nature of the topography indicated that a combination of shovel and dragline would be the most efficient equipment. Plans became reality, and stripping operations were begun in 1947 by Dick Construction Co. of Hazelton, Pa., who contracted the stripping of the Clintwood seam at Moss Mine, near Moss, Va.

While the primary purpose of the aerial survey was to furnish information for the stripping operation, it has become a very useful aid in planning deep mining and in solving various problems connected with deep mining. Some uses of the contour sheets made from the aerial survey are: (1) determining how much cover is over a particular entry or section of a mine thus anticipating and preparing for any unusual conditions. (2) Aids to land survey crews in resurveying old tracts of land which, in many cases, have boundaries which follow the ridges and streams. (3) Aid to company land agents in buying, selling, or subdividing land. (4) Layout of service roads to strip mine and deep mine operations.

### Use With Other Maps

One useful adaptation of the contour sheets produced from the aerial survey has been to make a map showing surface contours and mine workings. This is done by matching coordinate lines of the mine tracing with coordinates of the corresponding contour sheet. These sheets are then fastened together with scotch tape prior to making prints. If it is desired to have the mine workings dominant then the tracing with the mine workings is placed against the reproduction paper before exposure; similarly, if surface contours are to be dominant then the contour tracing is placed against the printing paper with the mine workings on top. These maps have been very useful to both the deep and the strip mine management. This type of map was made as an experiment and results were so good that it has since become standard. Careful work by the reproduction man making the prints has been a key item in making the maps. In all cases it has been possible to match coordinate lines so that they appear to be as one on the finished print.

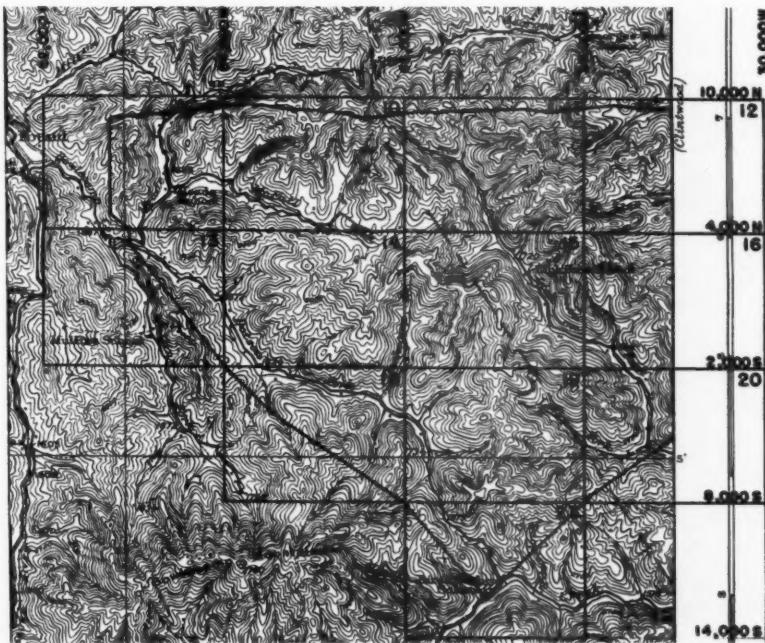
### Mining Method

Moss Mine is the largest producer of the Clinchfield Coal Corp., producing 10,000 tons of high grade metallurgical coal per day. Deep, strip and auger mining is practiced in a well coordinated operation equipped with the latest types of equipment for mining and preparing the Clintwood seam coal. Basic mining plans call for stripping the outcrop to a 45-ft

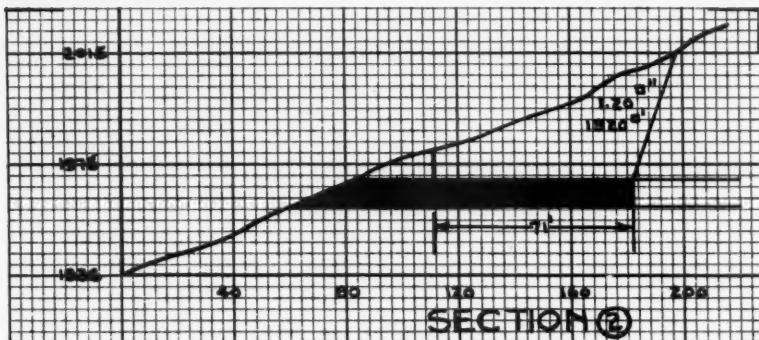
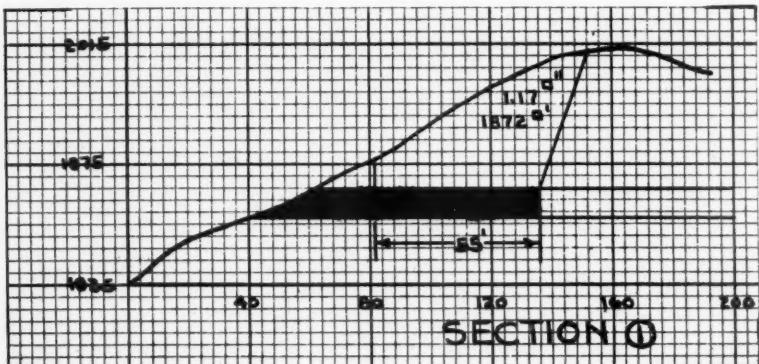
highwall; the coal around this highwall then being auger mined to a depth of 175 ft. The remainder of the coal under heavy cover is recovered by deep mining methods using large, high-tonnage capacity equipment. All mining is carried out on a two-shift basis. Normally, stripping operations produce 1200 tons of raw coal each shift, auger mining produces 370 tons per shift, and deep mining produces 4530 tons per shift. Total raw coal processed in the Moss preparation plant is 12,200 tons, resulting in 5000 tons of prepared product each shift or 10,000 tpd. Rejects from the preparation plant average 18 percent.

Deep mining methods consist of driving four parallel entries on 60-ft centers. Cross cuts, 16 ft wide on 80-ft centers, are driven at an angle of 60° with the entries to aid shuttle car haulage. Barrier pillars are 240 ft thick. Room entries are developed so that rooms will be 240 ft deep, limiting shuttle car haulage to 350 or 400 ft. Rooms are driven on 60-ft centers and pillars are extracted. High quality of the coal demands complete extraction of the pillars whenever possible.

Strip mining is done with large electric shovels of five-cu yd capacity and of a 10-cu yd dragline. The shovels work in areas of contour or outcrop stripping and the dragline works where the cover is thicker and the spoil must be cast a greater distance. Preparation for stripping consists of bulldozing a bench as a working area for drilling overburden. Joy Champion drills are used in drilling the overburden for blasting. Coal is loaded by electric-powered shovels into diesel-



Clinchfield property is outlined on a U. S. Geological Survey topographical map



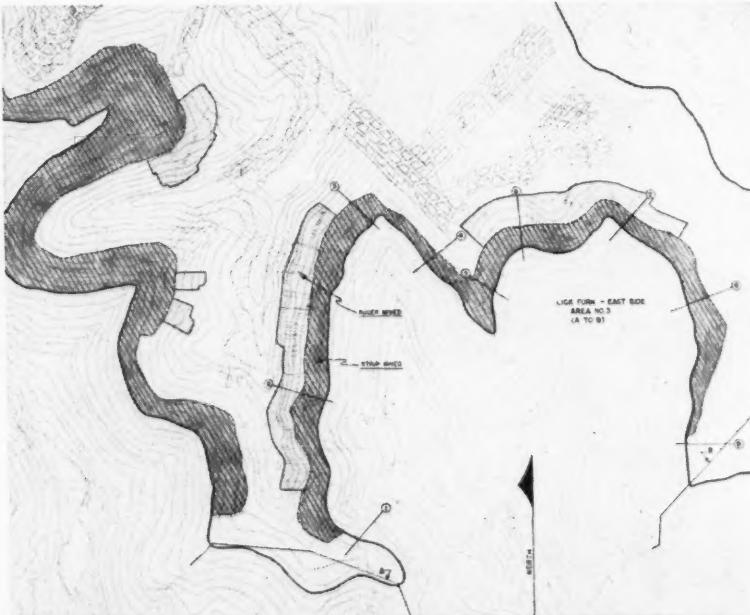
Future surface mining is planned with the aid of sections such as these

engine trucks of 14-ton capacity which transport it to a loading bin where it is transferred to mine car for transporting to the preparation plant.

#### 47.5 Tons Per Man-Shift

After the coal has been stripped to a 45-ft highwall, auger mining is begun with a 48-in. Compton Auger.

This auger is equipped with a 52-in. cutting head and is capable of mining up to 600 tons per shift. Average production of clean coal per shift is 370 tons. Holes are drilled 175 ft deep, yielding approximately 0.6 tpf. Under normal conditions four holes are drilled per shift. Auger mining makes possible high tonnage per man



Strip, auger, and deep mining are shown on this mine map. The sections in the top illustration were taken here

shift since only a few men are needed to yield large tonnages. Total manpower necessary to mine and transport auger mined coal to the preparation plant are:

- 1 Auger Operator
- 1 Auger Handler
- 1 Hydraulic Operator
- 1 Bulldozer Operator
- 4 Truck Drivers

8

Strip mining was in progress three to four years before the advent of auger mining at the Moss Mine. The best auger locations were started first. Having caught up with these locations augers follow the strip operations closely and are within 1200 ft of the strippers.

Following closely after the strip coal has been removed requires less cleaning up or dead work as the spoil banks have not sloughed off to any great extent.

#### Open Other Properties

At the time plans were way to open the Moss Mine, ideas were beginning to crystallize regarding two additional new mines—Meade Mine in the Clintwood seam adjacent to Moss, and Compass Mine to be developed as a strip mine in the Pittsburgh and Redstone seams near Phillipi, W. Va. The areas covered by these proposed mines were surveyed by aerial methods and contour sheets, scale one in. = 200 ft, were obtained. It was readily seen that Meade Mine could not be strip mined on as large a scale as Moss Mine although there were several areas favorable for strip mining. An opportunity for using large strip equipment with consequent large production was presented when the aerial contour sheets for the proposed mine at Compass were examined.

Again plans became reality and Meade and Compass mines were developed. Meade Mine now produces 5000 tons of Clintwood coal per day from deep and strip mine production. Mining methods and equipment are similar to those used at Moss Mine. No auger mining is done at the Meade Mine.

Compass mining methods consist of first strip mining the Pittsburgh seam back to a highwall where the Redstone seam outcrops. Equipment is then moved up to the Redstone and it is strip-mined to approximately a 50-ft highwall. Immediately afterwards the Pittsburgh seam is strip mined directly beneath the area where the Redstone seam has been removed. After strip mining is completed, auger mining enters the picture. A Compton auger, 48 in. in diameter, with a 52-in. cutting head is used for this type of mining. The remaining coal, after strip and auger mining is complete, is mined by deep mining methods.



Increased clearance and improved ventilation mean better, safer working conditions

# Roof Bolting in the Red Ore Mines Of the Birmingham District

OF the developments in underground mining operations for the past five years, the adoption of roof-bolting as a means of support for the exposed "top" or "back" in mine workings, both in coal and metal mines, ranks as the most important change in methods and techniques during that period.

In trying to reduce the high rate of accidents from roof falls in coal mines, the Bureau of Mines early in 1947 became interested in the adoption of roof-bolting as a possible solution to the problem of roof support. Since then, roof bolting has received wide and enthusiastic acceptance among coal mine operators with the result that, today, the coal industry out-ranks all other users of the method. Besides a great reduction in roof fall accidents, many other benefits have accrued from a production and cost standpoint.

Coincident with the interest in the utilization of roof-bolts in coal mines, it was also recognized that the method would work equally as well in some of the metal and non-metal mining fields. It applied particularly in operations where the mining of flat-dipping, sedimentary formations where poor roof conditions prevailed.

## Four-Year Experience at TCI Covers Installation of More Than 800,000 Roof Bolts

By L. S. CHABOT, Jr.

Works Industrial Engineer  
Ore Mines and Quarries  
Tennessee Coal and Iron Division  
United States Steel Co.

The pioneering work was done some twenty odd years ago by the St. Joseph Lead Co. in the original development of the method for overcoming bad roof conditions in southeast Missouri. The new general interest led to a variety of uses in metal mines such as: wall support in vertical stoping operations, pillar sloughing control, shaft sinking in weak ground, and in driving tunnels or haulageways through steep-dipping and incompetent formations.

### Began Bolting in 1948

Subsequent to visits to the St. Joseph Lead Co. mines at Bonne Terre and Leadwood, Mo., and discussions with the Roof Control Section of the U. S. Bureau of Mines, roof-bolting

was introduced in the Birmingham iron ore mines of the Tennessee Coal and Iron Division, United States Steel Co. in July 1948. Its application was expanded as rapidly as possible to all mines.

At the present time Alabama leads all states in roof bolting applications for metal mines. This, of course, is due largely to the occurrence and type of ore deposits mined in the state. Iron ore—locally called "Red Ore"—of the Birmingham district is mined from the "Big Seam" which occurs in the Clinton formation of Silurian age. The "Big Seam" outcrops along the crest of Red Mountain, which is a part of the southwestern extremity of the Appalachian Range. The ore seam dips at about 17° to the south-

east under the floor of Shades Valley. Current mining operations are under from 1000 to 2000 ft of cover and the thickness of seam mined varies from 8 to 14 ft. The Birmingham district ranks next to the famed Mesabi Range of Minnesota in volume of iron ore production.

The ore is a primary sedimentary deposit of both fossiliferous and oolitic hematite, hard and dense in structure, averaging around 37.5 percent iron and containing varying amounts of silica and lime which, in their combination, permit the use of the ore in blast furnaces without treatment or improvement.

### Top Is Slabby

Roof material overlying the ore bed consists of thinly laminated shales interbedded with shaly sandstone seams all of which are structurally weak and have a tendency to break away in flat pieces and tabular slabs of larger size unless supported.

Most of the mining is done by the room and pillar method. Ore is loaded by trackless, electrically-powered mechanized equipment. In some areas, due to the steep dips of the ore seam, ore is loaded from the rooms or "stopes" with scrapers pulled by large, track-mounted, double drum hoists, discharging over steel ramps into mine cars. This drag-scaper setup was the conventional method of mining before the installation of trackless mechanized units. Mine cars are hauled by electric locomotives to large storage pockets at the slope bottoms, from which the ore is hoisted



Roof Bolting is highly mechanized at TCI

in 16-ton skips to the outside tipples.

The Tennessee Coal and Iron Division operates eight iron ore mines in the district with nine active hoisting slopes ranging from 3500 to 6700 ft in length. Other iron ore mine operators in the district include Republic Steel Corp., Woodward Iron Co., and Sloss-Sheffield Steel and Iron Co.

Prior to the acceptance of roof-bolting, the standard system of tim-

bering in rooms, cross-cuts and haulageways consisted of placing 12 by 12-in. square fir timbers—locally termed "collars"—against the roof, supported at each end with a steel plate laid over two steel pins fitted into short drill holes in the rib, and anchored by side pins to prevent lateral shifting. The steel pins, two ft long and two in. in diameter, protruded from the drill holes and served as a platform or basket for the end of the square timber. Collars ranged from 14 to 22 ft long and required a crew of seven men for installation. Collars were put on eight-ft centers in haulageways. Occasional diagonal timbers at cross-cut openings required lengths in excess of 22 ft. Many haulageways required much closer timbering and frequently steel reinforcing was needed.

Space between the collar and the roof was securely blocked with short pieces of timber and wood wedges. In some of the rooms and stoves, 10 to 12 in. round timbers, used as props between footwall and roof, were set in rows as mining advanced.

### Timber Not Satisfactory

Great difficulty was encountered in maintaining wood timbering close to the working face. Too frequently, collars set eight ft from the face would be blown down by a shot at the face, causing rock falls which carried away adjacent timbers. Rock falls were difficult to separate from the ore and resulted in much lost time due to cleaning up waste rock and re-timbering.

Roof-bolting was applied in the ore mines at approximately the same time as mechanized mining methods were



Timbering formerly required seven-man crew

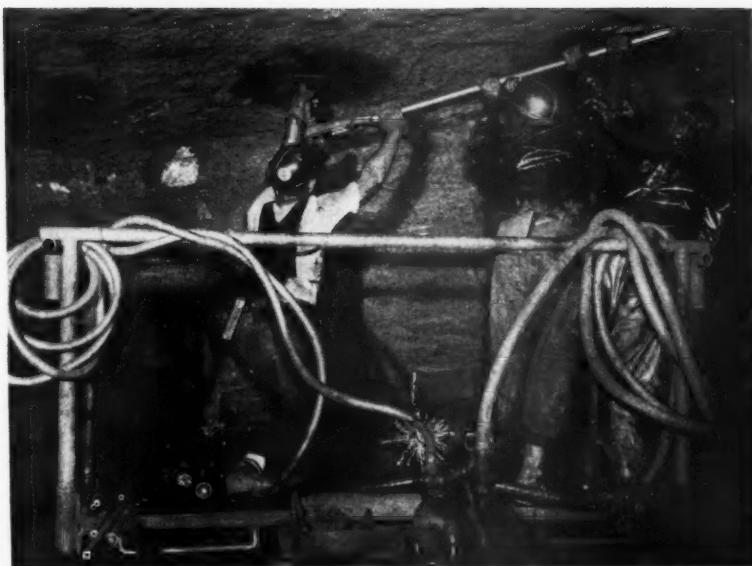
introduced and expanded. The combined problems associated with the use of the two techniques have required considerable study and analysis, the results of which provide the mine supervisors with useful and valuable criteria for control and performance comparisons. These have been used in the derivation of standards and specifications.

### Technology Advanced

Improvements and changes which have been made in roof-bolting practice at the T. C. I. ore mines since the inception of the program are as follows:

Initial practice was based on 1½-in. holes drilled in hard shale and shaly sandstone roof. Due to the use of one-in. quarter-octagon steel on stoppers at that time, the smallest steel detachable bit available was of 1½-in. gauge. Drilling speed for this bit, averaging four ipm, was too slow; bit life was poor, ranging from one to eight ft; and gauge loss resulted in erratic hole size—an important factor if bolts are to be uniformly seated at proper depth. Detachable carbide insert bits were then tried, in 1½ in. diam, resulting in drilling speed increase to 12 ipm. However, bit life, averaging 65 ft of drilling, was not considered satisfactory from a cost standpoint. Bit failures were due principally to broken skirts, wearing of threads and poor connections with the rod, pointing up the need for an integral type of rod.

Desirability of a smaller hole for roof-bolts also entered into the picture at this time, based on the results of special pull tests. Pursuant to the commercial development of carbide insert steel drill rods, a change in practice was made in 1949, drilling 1¼-in. holes, using ¾ in. quarter-octagon, carbide insert alloy steel drill rods, having a 1¼ in. chisel bit. Drilling speed increased to 15 ipm and rod life for this type of steel averaged 132 ft of drilling. This performance exceeded that of various types of 1½ in. detachable four-point carbide bits.



Routine torquemeter tests are an integral part of the program

Comparative tests, from March through May of 1952, on 1¼-in. chisel type versus 1¼-in. four-point carbide insert alloy steel rods of ¾ in. diam, showed that despite the higher cost for the four-point carbide rod, great advantages were in favor of its adoption. These include:

- (1) A 64 percent increase in rod life
- (2) An 11 percent increase in drilling speed
- (3) A 34 percent reduction in cost per foot drilled

This equipment has gradually replaced the old type chisel steel as it wears out. It is in virtually 100 percent use at this time.

Gauge differentials on steel changes have, for some time, been established as being from 0.010 to 0.015 in. per change. Experiments with 0.006 to 0.008 in. differentials proved unsatisfactory.

Stopers, in use from the first, are of the 90-100 lb, wet-type class. A safety hand shield welded on the

throttle lever, and the use of "New York" type air control valve to prevent dry collaring of holes are innovations.

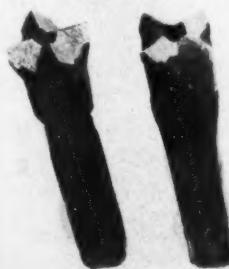
Roof bolting carriages have been redesigned to provide better balance and space utilization, self-leveling platforms, a boot for the stoper leg, improved controls and better maneuverability.

### Materials Pass Rigid Tests

Testing for the holding strength of the roof bolt; bolt and wedge design; and the best method of manufacturing roof bolt items have received closer study than any other phase in the whole program.

The important relationship of wedge size to the holding strength of a one-in. slotted roof bolt for various sizes of hole in the roof rock of the ore mines was recognized at the beginning, following a series of pull tests. These experiments also included strain data for various shapes of the outside surfaces of the slotted end of the rod. In these initial tests it was proven

1½" STEEL BIT  
STEEL ROD



1½" CARBIDE  
STEEL ROD



1½" CHISEL CARBIDE  
INSERT ALLOY ROD



1¼" FOUR POINT CARBIDE  
INSERT ALLOY ROD



Evolution of 1¼-in., four point, carbide insert alloy steel rod for drilling bolt holes

ORE MINES AND QUARRIES—ACCIDENT STATISTICS						
YEAR	1946	1947	1948	1949	1950	1951
ROCK FALL ACCIDENTS						
FREQUENCY	2.39	3.67	1.47	0.83	0.97	1.67
ALL ACCIDENTS						
FREQUENCY	17.94	19.36	17.59	7.83	8.57	7.44
SEVERITY	6.73	8.24	7.09	5.27	4.05	2.20
Rock fall accidents have been markedly reduced since first roof bolt installations were made						

that a six-in. tapered wedge, with a  $\frac{1}{2}$ -in. butt thickness, registered a holding strength of approximately 15 tons in a  $1\frac{1}{2}$ -in. hole. Failure at that load was generally due to slipping of the rod.

Corrugations on the outside surfaces of rods, as used in some districts, and bulbar shapes designed to establish better wall contact between rod and hole, proved inferior to a smooth rod, besides adding considerably to the cost of manufacture.

Later, when carbide insert drill rods became available making possible the drilling of smaller holes, a series of tests to develop better anchorage was initiated during which a number of different bolt-wedge designs were tried out. These tests led to the adoption of the  $1\frac{1}{4}$ -in. drill hole, a one-in. round rod of rivet grade steel for the bolt, with a burned seven-in. slot, used with a six-in. tapered wedge,  $\frac{1}{2}$  in. thick at the butt end. Strain tests on the above combination in various types of roof rock recorded from 16 to 21 tons before failure. Approximately 25 percent of the bolts failed in the lower range due to slipping and 75 percent failed at the upper range by breakage of the bolt, usually in the threads.

### Produced on Assembly Line

During 1951, a new method was developed for the manufacture of roof bolts and a new assembly line was designed and installed at the shops of the Fairfield Steel Works, where the requirements for both ore mines and coal mines are produced.

This completely automatic assembly line handles 24 and 25-ft lengths of rivet grade mill rods, shears them in lengths of from three to 10 ft, depending on coal and ore mines requirements, and are fed to a threading machine. Here cold-rolled threads are formed on the rods, and they then go by conveyor table to a gas-fired furnace where the opposite ends of the rods are heated to approximately  $1450^{\circ}$  F. The rods are next conveyed to a piercing machine which slits  $7\frac{1}{2}$  in. of the heated end, after which they are drawn through rolls which close the slit ends together. Finished bolts are bundled in groups of six and then in larger packages of approximately 100.

The finished pierced bolt differs from the former burned type in these respects: no slot metal is burned out;

rolled threads replace cut threads; minimum cross-section of rod at slit end and at the root diameter of thread end is equal to one in. round.

In almost every case of tension failure on the old type rods, the break occurred in the cut thread section, the point of least sectional area on the entire rod.

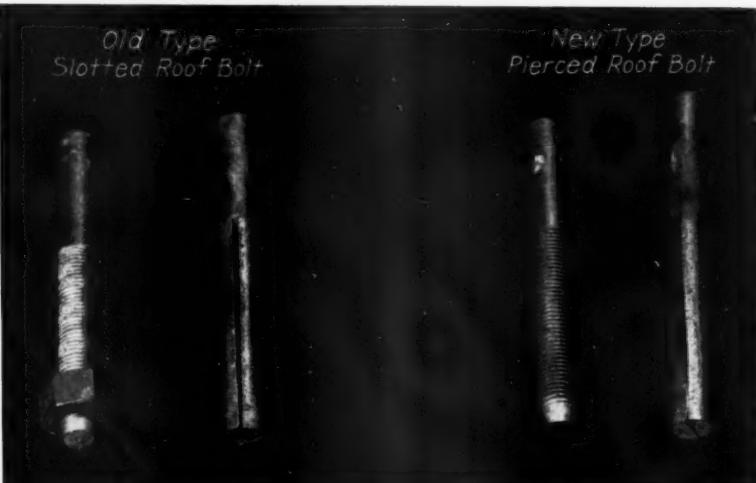
However, while still in the process of testing at this time, current results have already indicated practice changes and benefits for the pierced rod. The first studies were made with the old standard wedge—six in. long,

Bolt spacing varies from 5 by 5 ft to 4 by 4 ft, depending on roof conditions. In some special instances, where abrupt folding, slips or fractures occur in the roof, a 10-ft length of bolt is specified and closer bolt spacing is required.

Routine torque meter tests on current and older bolt installation are made by the safety inspectors. Readings between 300 and 500 ft-lb are considered satisfactory checks on installation and furnish an index of the condition of impact wrenches. This routine check has also instilled the necessity of good practice on roof-bolt crews. Proposed for adoption is a program on complete checking of haulageway bolt installations to determine rusting action, rock formation oxidation, and time interval effects.

### Important Benefits Derived

Roof-bolting constitutes the most important development in mining over



Rolled threads, pierced slit, assembly line production mark new type roof bolt

$\frac{1}{2}$  in. thick at butt end—and failure occurred due to slippage at about 75 percent of the strength of the old type rod. Recent tests, using a six-in. tapered wedge with a butt thickness of  $\frac{1}{2}$  in., have resulted in an average strain of 23 tons before failure, all of which consisted of breakage of the rod. The desired goal—failure of the rod by breakage, not by slipping—has been achieved, but the never-ending task of refinement and improvement continues.

### Specifications Developed

Standard normal lengths of bolts are five, six and eight ft. Determination of length used in any mining area is based on structure data from short diamond drill holes put in at approximately 500-ft intervals as mining areas advance.

the past few years. That claim can be substantiated by an analysis of the benefits derived.

(1) Better safety records. Such improvement has been effected in other companies, and can be demonstrated by a comparison of frequency of accidents from rock falls for the years 1946 through 1951 and total frequency and severity for the same period.

(2) Increased production as a result of reduced timbering delays

(3) Elimination of waste rock dilution

(4) Reduction in quantity and bulk of roof support material handled

(5) Reduced costs for roof support

(6) Increased clearance for the operation of equipment

(7) Improved ventilation due to lower resistance to air flow

(8) Reduced maintenance of haulageways



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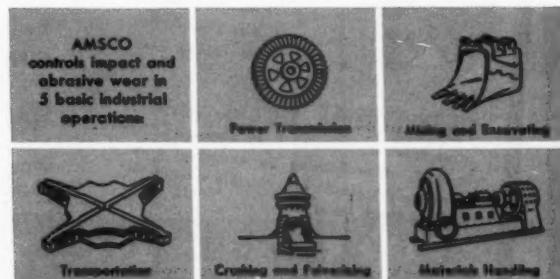
Service like this is expected—and considered normal—by users of AMSCO Dippers. Just as users throughout all industry know that AMSCO Manganese Steel Products mean service and long life wherever impact and abrasion must be controlled. AMSCO Manganese Steel has the unique quality of actually becoming harder with use, acquiring a high surface polish to shrug off grinding abrasion, while retaining body metal toughness.

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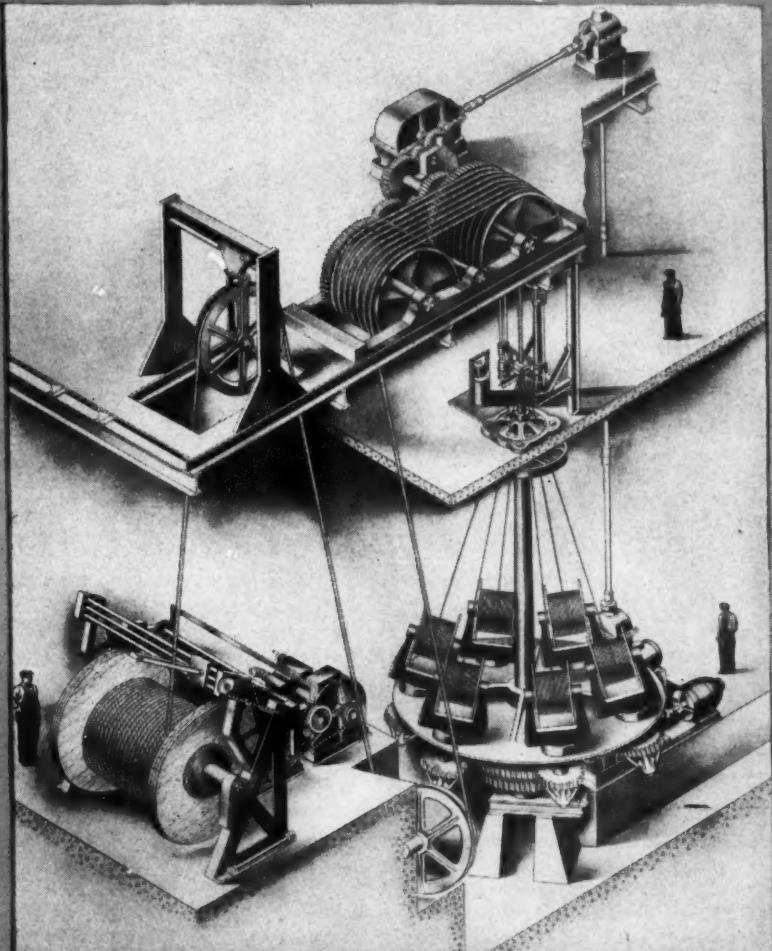
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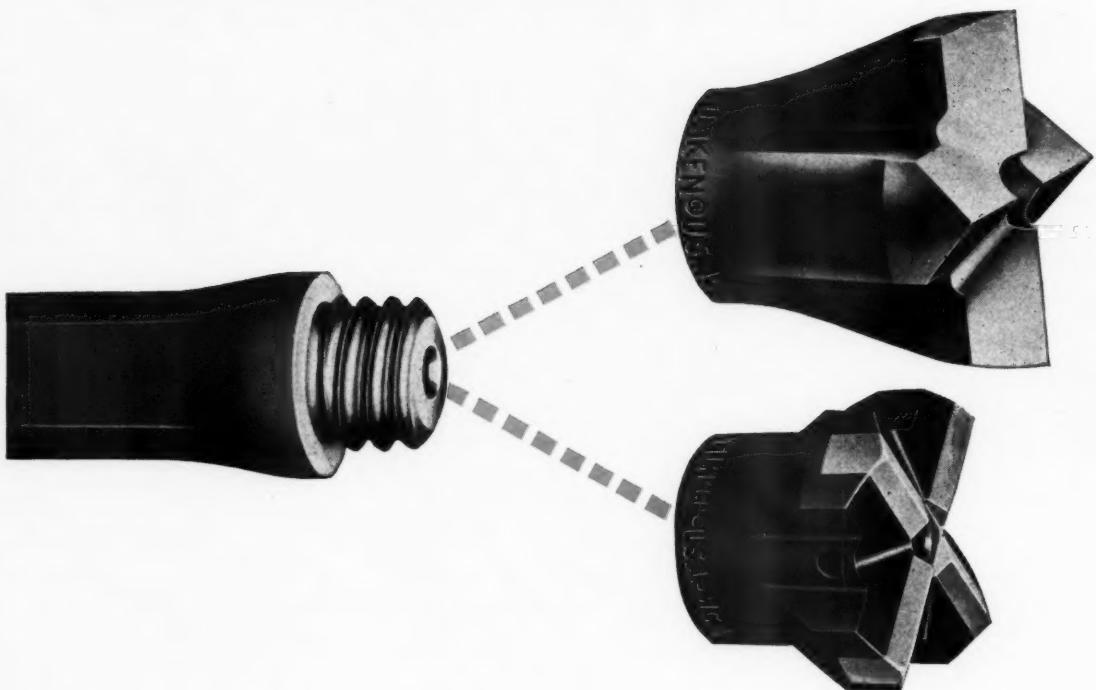
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Big equipment is used to strip, load and haul coal from a 17-in. seam in Kansas

# Mining in Thin Seams

**It Requires Special Techniques To  
Make Money Mining 17-in. Coal**

By **F. J. FORESMAN**

Personnel Director  
Pittsburg & Midway Coal Mining Co.

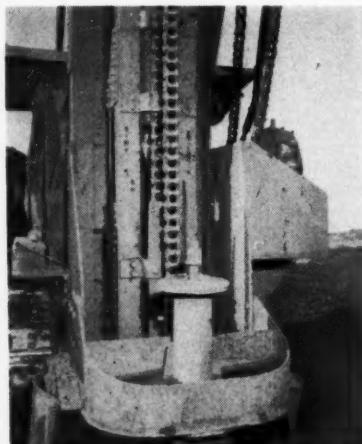
STRIP mining of thin seams of coal, such as the Fleming and Mineral seams found in the coal fields of southeastern Kansas, must be carried on with the utmost efficiency to be economically feasible. Not only must pit operational procedures be carefully planned and proper excavating equipment used, but loading equipment, especially adapted for the job, must be selected.

Through many years of experience in mining thin seam coal, the Pittsburg and Midway Coal Mining Co. of Pittsburg, Kans., has found equipment such as the pinning machine and the horizontal thrust type loader to be both economical and efficient. The company has been engaged in mining operations since 1885 and has been mining thin seam coal since about 1914.

## Eliminate Blasting Hazards

As a means of breaking the coal seam in preparation for loading, the pinning machine has many advantages. Safety, economy and efficiency are but three. The use of explosives

to break the coal has been completely eliminated, thereby removing the hazard of "wild shots" which occur occasionally as a result of the struc-



Lugs on roller chain lift 4800-lb weight and 10-in. pin 10½ ft into the air then let it drop.

ture of the material underlying the thin seam of coal. Prior to the use of the pinning machine, a crew of four men, consisting of two drillers and two shooters, was required to keep the coal broken ahead of the loading shovel. Now one man with the aid of the pinning machine can do the job. Also greater efficiency is achieved through a smaller work crew and less equipment to handle.

This reduction in labor costs, together with the elimination of explosives, results in lower loading costs, an important factor, especially when overburden ratios are unfavorable. Coal pinning also produces fewer fines, which adds to economy through increased realization.

Coal pinning was first attempted in 1940 by the Sinclair Coal Co. at their Broken Arrow mine in northeastern Oklahoma. The pinning machine was designed and constructed by a mechanic employed by the company. It proved so successful that many other mining companies faced with the problem of loading thin seam coal began using pinning machines patterned after the Sinclair model with good results.

Since the first was constructed, many improvements have been made as a result of operational experience. Often the machines are constructed by installing the pinning attachment, made either in company or commercial shops, on standard tractor models. However, complete custom units may be purchased. Such a machine is



Tapered tool steel pin is driven into the seam to break coal by its wedging action



With boom sticks horizontal, toothed bucket starts its 19-ft travel

produced by the United Iron Works of Pittsburg, Kans.

The pinning machine attachment currently in operation at Mine 19 of the Pittsburg and Midway Coal Mining Co. located near Hallowell, Kans., is mounted on a Caterpillar Diesel RD7 Tractor. Some earlier attachments were mounted on smaller machines but experience has shown that the larger machine is more economical to operate because of greater efficiency and less maintenance work.

The attachment consists essentially of a tower with an inner barrel and a heavy weight equipped with a 10-in. tapered pin.

### Pile-Driver Principle

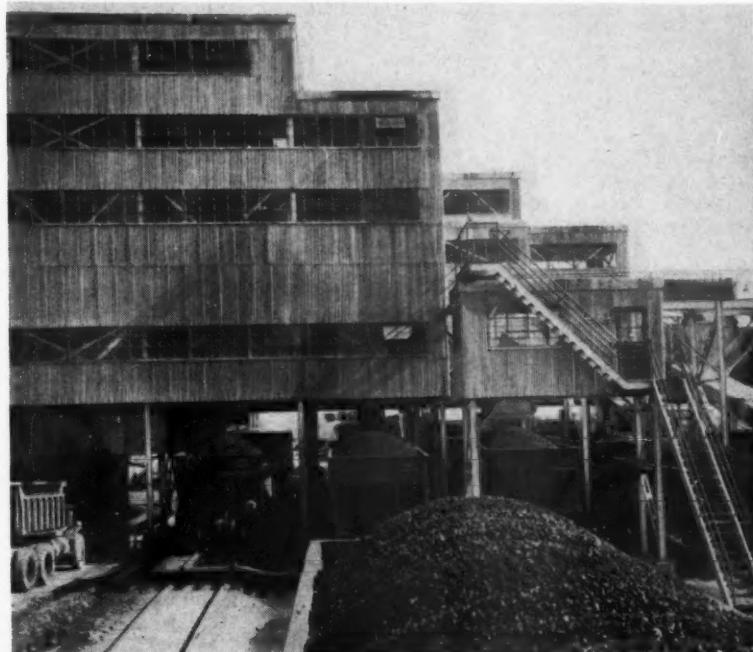
The tower consists of a main bracket mounted directly on the rear of the tractor. Located on the inside of the tower are four 6-in. steel channels, forming the barrel within which the weight of approximately 4800 lb operates. Set in the bottom of the weight is a pin 10 in. long, held in place by a bolt so that it can be removed and replaced when worn or bent. The head of the pin is 4½ in. in diameter for a distance of six in. From here it tapers to 1¼ in. at the end. It is made of Atlantic tool steel. Experience has shown a pin less than 10 in. long does not get the wedging effect, and a longer pin tends to stick, causing the chain to jerk when the weight and attached pin is lifted.

The weight is operated by means of a No. 200 roller chain that goes over a head sprocket. As the chain, equipped with two sets of lugs, travels over its course one set of chain lugs engages the lugs attached to the weight, raising it to a height of approximately 10½ ft. There the lug rolls over the sprocket and allows the weight to drop. The lugs on the chain are spaced equi-distance apart so that the weight is dropped twice in each

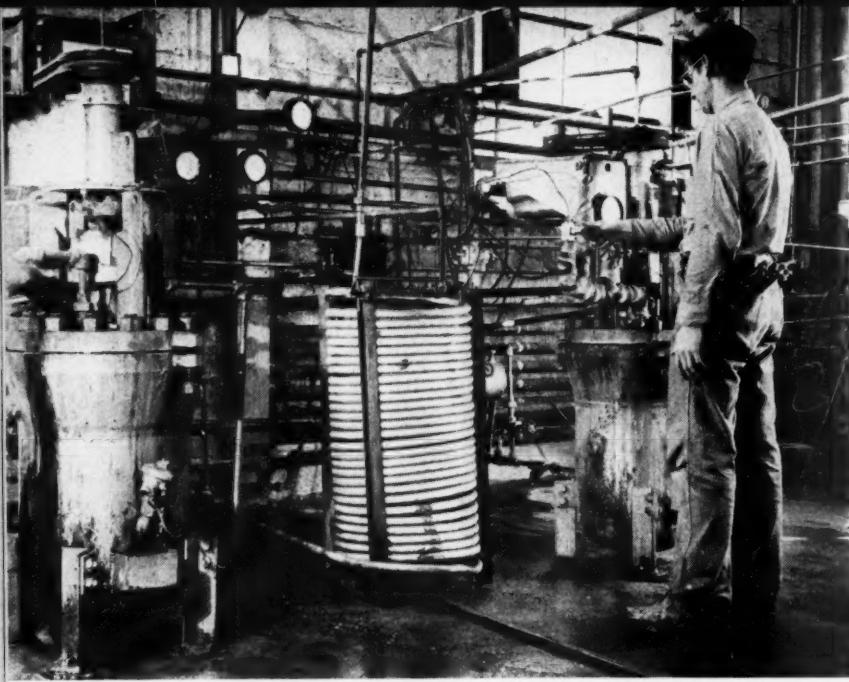
(Continued on page 63)



Pulling trip pin lets bucket tip forward to dump five tons of coal into 40-ton trailer



Strip coal is cleaned and sized in P&M's new washery, one of the most modern plants in the district



High pressure autoclaves are the heart of the process

## Chemico Metal Techniques

**New Metals Extraction Processes Bring Chemical Industry Methods and Experience to Bear on Mineral Industry Problems**

By MAJ. GEN. WILLIAM N. PORTER

President,  
Chemical Construction Corp.

CHEMICAL Construction Corp.'s experience in this field is relatively short in time and limited in scope. It covers seven years' hard work admittedly not very long in a business as complex and diversified as the mining and metals industry.

In spite of this there is some background for the work undertaken.

- (1) In the first place the American Cyanamid has been for over a quarter of a century a leading producer of mining chemicals, and has made available the benefit of its vast experience in that field.
- (2) Chemico itself has worked with metallurgical companies on projects for recovery of sulfur from ores as well as gases, and the manufacture of sulfuric acid and ammonium sulfate in connection with their activities for two or three decades.
- (3) More immediately important in the development of Chemico metal techniques, has been the direction,

assistance and support of three important mining companies, the Sherritt-Gordon Mines, Ltd. of Canada, the National Lead Co., and the Howe Sound Co. The Chemetals Corp., which holds sublicensing rights for the techniques to recover copper from scrap, has also supported and forwarded the exacting and difficult pilot work on a scrap process, now ready for commercial application.

- (4) Finally, the approach to these metallurgical developments has been from the point of view of—and with the techniques of—the chemical industry. In that field Chemico has had long experience.

### Chemico Metal Techniques

We should like to tell you *all* about these metallurgical techniques or at least enough about them to enable each of you to evaluate them in terms of your own particular business.

However, this cannot be done, for over and above the claims protected by patent structure, the valuable know-how acquired is, of course, confidential to Chemico and its clients.

Furthermore, the application of these techniques varies radically in procedure with each type of ore and each customer's economic problems.

There are consistent fundamental operational techniques, just as in the mining business. Finding ore and getting ore out of the ground are fundamental operations. But from then on, no two ores are exactly alike, nor are they processed in the same way. So it is with metal extraction techniques, each must be tailored to fit the ore or concentrate.

It is, therefore, readily understood that any specific technical description and operating data given here would not be significant out of full context.

What can be given that may be interesting, and useful, is an outline of the economics of the Chemico Metal Techniques and their *inherent* advantages. It should be remembered that they are still in the pioneering stage and experience is limited. So, these analyses shall be confined to projects which have already been undertaken with confidence.

There are three projects. Two are primarily the refining of cobalt metal from concentrates, and the third the processing of a nickel concentrate. All three are mixed concentrates containing significant amounts of cobalt, nickel and copper. The higher priced metals, cobalt and nickel, where the margin in production cost is wider, naturally attracted and encouraged application of these new techniques.

What is said here about the economics of these techniques will, therefore, be confined to a discussion of the estimates and piloting experience with mixed nickel, cobalt and copper concentrates—where nickel and cobalt are the primary values. Chemico has also worked on copper and later on this development will be discussed with a brief comparison of the estimates made with conventional smelting and electrolytic refining production costs.

Many of you know already that in these processes ore or concentrates are leached at elevated temperatures and pressures in ammoniacal or acidic slurries with oxygen or air. Conditions are established to dissolve the valuable metals and leave most of the iron, arsenic and the like in the residue. Gold, silver and other valuable metals, not dissolved, may be recovered from leach residue by usual methods, such as cyanidation.

The leach liquor is a mixture of the sulfates of valuable metals and some impurities. The problem from there on is to purify this liquor. If there is more than one metal, separate the various metals cleanly. Then precipitate separate pure metal powders by

treatment with a reducing gas, such as hydrogen or carbon monoxide. Flowschemes are designed and engineered by the combined talents of chemical and metallurgical engineers, sulfur, ammonia and crystallization technologists, physical and theoretical chemists.

The separations made and the metal purities achieved can, for the most part, be duplicated by any well-trained chemist. But Chemico's claim is that it can do this profitably on a commercial scale. In the plants designed to date better results can be achieved more cheaply, in most instances, than by present smelting and refining methods.

The concentrates piloted and developed to the point of commercial application are all complex and one of these, the arsenical cobalt, is distinctly difficult. Here high arsenic content is a serious difficulty in normal processing. The problem of separating nickel and cobalt has been solved very satisfactorily and the technique seems economically attractive.

### Economic Aspects

It is well known that Chemical Construction Corp. is building for Sherritt-Gordon a \$17,000,000 metallurgical plant at Fort Saskatchewan, Alberta, which will produce as its primary product some 25,000 lb of nickel daily from 250 tons of complex nickel-copper-cobalt concentrate. From the \$17,000,000 capital investment in the Sherritt-Gordon refinery, some \$5,500,000



Any well trained chemist can duplicate the separations and purities in the laboratory

will go into a 75-ton a day ammonia plant. The Sherritt-Gordon flowscheme, was conceived in part by Sherritt-Gordon's consultant, Prof. Frank Forward and in part by Chemico's engineers, and it was developed and piloted as a joint project. The ammonia leach system presented a very attractive picture, since aside from recovery of metal values in the concentrate, the \$5,500,000 investment in an ammonia synthesis plant made it possible to recover the sulfur in the concentrate and combine it with the ammonia in the system to produce

directly 70,000 tons per year of ammonia sulfate, badly needed as a nitrogen fertilizer.

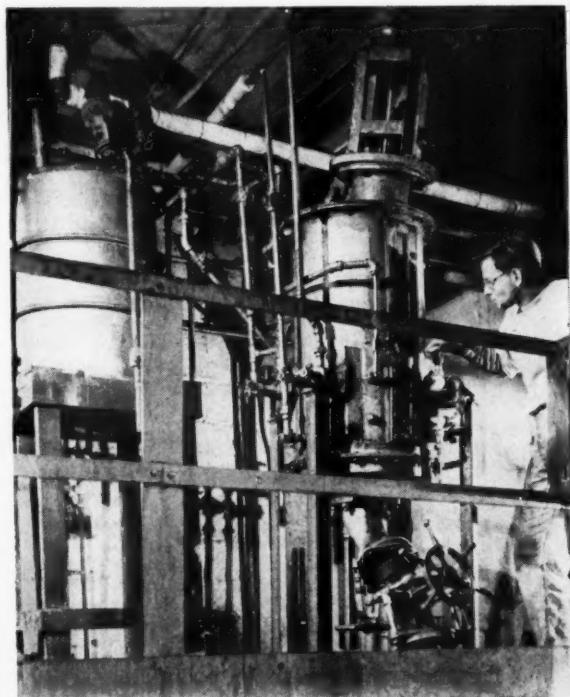
The capital investment in this project covers, therefore, two enterprises: metal refining and the manufacture of ammonium sulfate. Interdependent as they are and taken together, the studies and estimates show that Sherritt-Gordon has a very sound and profitable combination business.

With approval of the Canadian Government, the Canadian National Railroad is building 145 miles of railway line to Sherritt-Gordon's Lynn Lake Nickel Mines. Although freight from Lynn Lake will eventually pay for this rail extension, the Canadian Government's willingness to construct the line is an expressive indication of official confidence in Sherritt-Gordon's project.

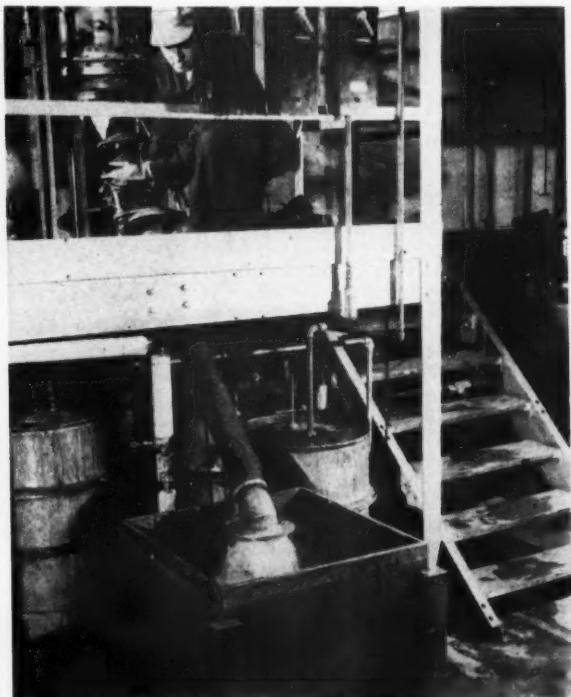
Insofar as the production cost of nickel and cobalt can be isolated in the accounting, Sherritt-Gordon is in a position to compete with any nickel producer in the world, and very probably has a distinct economic edge over the most efficient conventional processes.

This compact plant, which will occupy only 150,000 sq ft of floor space (including ammonia and ammonium sulfate units), will turn out metal and fertilizer products worth about \$11,000,000 per year at current prices.

It is useless to speculate about the capital cost of a conventional nickel smelting and refining plant of similar capacity—for the essential process



After it is precipitated in autoclaves, metal powder is washed clean of leaching solution



Water and metal powder pour out of washing tank into box filter for preliminary drying

steps are controlled under patent. However, it is believed that Sherritt-Gordon's \$17,000,000 metallurgical refinery could not be matched by a conventional smelter and refinery for the same money, and certainly its operating costs could not be bettered.

In collaboration with National Lead Co. research and development of a flowscheme based on the Chemico Techniques was begun in 1949 to process the Fredericktown, Mo., cobalt concentrates which also contain significant quantities of nickel and copper. At present, a \$7,500,000 plant has been designed and is being built for National Lead. It is scheduled to begin production a year from now. This 50-ton per day refinery, using an acid leach system, will produce cleanly separated cobalt, nickel and copper metal powders. National Lead will have to purchase a small amount of ammonia, which will be recovered as ammonium sulfate. Sales of this ammonium sulfate should not only offset the cost of the ammonia, but even make a neat profit.

Howe Sound Co. had a really difficult problem. Their property in Southern Idaho contained large known deposits of cobalt mineral. Since the mineral was cobaltite, it was doubtful whether it could be classified as an ore.

Howe Sound's little plant near Garfield, Utah, is contained in something less than 20,000 sq ft of floor space and will cost about \$2,500,000 to build and equip. A little plant, but a real taxpayer too, when one considers the performance expected of it. Daily 35 tons of cobalt concentrate will be fed into the system. Of this tonnage there will be over three tons of arsenic. A smelter would find this a very obnoxious contingency, but in Howe Sound's plant there's no problem because practically all the arsenic remains in the barren leach residue, while the cobalt, nickel and copper, converted to soluble sulfates in the leach liquor, proceed through the system. (The copper is removed as quite pure copper sulfide for conventional processing, because the quantity is not sufficient to warrant, at present, reduction to copper powder by our techniques.)

The mixed cobalt and nickel salts that remain in solution can be cleanly separated. But since there is a good market for a 95 percent cobalt-five percent nickel product, for the time being, there's no advantage in making a complete separation.

Howe Sound's processing calls for the purchase of a few tons per day of ammonia, but again, as at the National Lead plant, this ammonia will be recovered in the form of ammonium sulfate and resold at a profit.

Statements made here do not reveal the real importance of this project. Annually this refinery will produce over 2000 tons of cobalt powder. The total consumption of cobalt in the

United States in 1951 was around 5000 tons. Most of this had to be imported from Africa.

Now this one \$2,500,000 plant is designed to produce 40 percent of our national requirements. When National Lead starts producing and also Sherritt-Gordon, these three companies will be in a position to compete and stay in competition with much higher grade cobalt ores from Africa.

However, from the very beginning of the research, back in 1945, it seemed that these techniques, by their very nature, had inherent economic advantages over conventional metallurgical practices.

As far as can be determined, capital investment required for a Chemico plant is not far from that which would be needed for smelting and electrolytic

amortization, but including credits for by-products and precious metals.

At this point it should be mentioned that of concentrates so far investigated, none contained any of the precious metals in valuable amounts. This subject is being investigated at present and some answers should be available before long. Recently a technique was worked out for handling refractory gold, arseno-pyrite concentrates.

To get back to production costs. There are several items in operational categories in which Chemico processes should have advantages over smelting and refining. Some of them are freight costs, labor, reagent materials, and maintenance.

Saving on freight charges can be visualized quite easily. Once the con-



Solids are filtered out of solution which is then pumped to measuring tanks that feed autoclaves

refining installations of the same capacity. Where flowschemes call for quantities of ammonia, the synthesis plant increases capital investment, but as pointed out, this is offset by profits from sales of ammonium sulfate. A conventional smelter can sometimes profitably manufacture ammonium sulfate but it is patently a more expensive procedure and, therefore, less profitable.

### Low Operating Cost

It is in metallurgical production costs that the margin of advantage is a telling factor. By production cost is meant the cost per lb of metal from concentrate to finished metal products, in marketable form; that is, exclusive of mining, milling and concentrating charges or any charge for the concentrate itself and excluding also

centrate reaches the plant there are no more charges for freight. No more handling, reshipping to refineries, or handling again of partially processed material; freight to the plant and shipping finished products to market, that's all.

### Need Fewer Man-Hours

As to labor. A Chemico plant requires about  $\frac{1}{3}$  to  $\frac{1}{2}$  the man hours to process a given tonnage of concentrate, as compared to smelting and refining. Since labor is a smaller item in our operating costs, production costs are less affected by wage increases: less likely to be crippled by manpower shortages.

Estimates for maintenance are based on experience with similar equipment in chemical industrial installations. There is no foreseeable reason why



Metal powder pours from rotary drier in pilot plant. In commercial installations drying will be continuous

Chemico plants should need more than a four percent allowance for this item. Many pieces of high pressure equipment have given twenty years of uninterrupted service.

### Expect High Recoveries

Recoveries of from 96 to 99 percent from concentrates are the goals of all Chemico design and this applies to complex concentrates containing several metals normally difficult to separate, such as copper, nickel and cobalt in significant amounts. With certain leach techniques, where it is economically indicated as worthwhile, it is possible to attain virtually complete recoveries.

In normal smelting and refining, even when the whole gamut from concentrate to finished product is carried through in one locality, the operation is essentially a batch technique. These new processes aim at continuous operation, and carry concentrates through to finished products. This means, economically, that intermediate inventories—and the frozen capital that they entail—can be eliminated from the books. The point here is that the materials in process are liquids and gases which can be readily piped from step to step.

The time factor in processing concentrate may not always be an important one. However, it is usually a fact that there is an attractive advantage in speedy processing. The new techniques generally require only a few days, from concentrate to finished product. Compare this with the many weeks, or even months, that are accepted as normal processing time in smelting and refining. The producer can now keep himself closely in touch with his market. One of these plants, running at partial capacity, can within a few days be stepped up to full capacity. In other words, all guessing about ability to meet future market requirements—up or down—is eliminated.

### Powder Metallurgy Growing

The metals produced will meet the highest commercial standards for purity. The product, in powder form, is immediately ready to be pressed into convenient sizes, or molded into shapes; copper,—and perhaps some of the other metals,—can be directly extruded as wire or rod.

Powder metallurgy is a new and rapidly growing field, which has been limited heretofore by a *scarcity* of metals in powder form. Presently there is a small, but good, premium market for metal powder.

As a result of these inherent advantages, comparative estimates have shown savings of 20-80 percent over smelting and refining. The largest percentages usually apply to the higher price metals.

### Process for Manganese

For several years Chemico has been interested, with Chemetals Corp. a licensee in developing a process for low grade manganese ores. This is a project of great importance because manganese is high on the list of strategic materials. Presently this country is dependent on imports for this metal, although we have vast resources of manganese in the form of low grade ores. The process developed has been rated a good one for handling low grade manganese ores, but would require piloting on a scale commensurate with the scale of commercial application.

Some months ago a copper project merited interest enough for the design of a hypothetical flowscheme and comparative estimates. By estimate, the metallurgical production cost for treating this concentrate by conventional methods would be between 2 and 3 cents per lb of copper. The estimates for treating this same concentrate, by the method designed was approximately the same. The capital invest-

ment for conventional methods was well over \$10,000,000. Our capital investment for the Chemico plant was some \$5,000,000 in excess of this figure. Off-hand, this would appear to be a distinct disadvantage compared with conventional processing. In this case, an installation was envisioned which would produce some 120 tons of copper per day. However, when the overall economics of this project are considered, the picture changes radically. The extra \$5,000,000 in capital investment was for an ammonia plant to produce ammonia in quantity for around \$32.00 per ton. This ammonia was needed in the leaching system. But, it would be recovered in the form of some 450 tpd of ammonium sulfate. In each ton of ammonium sulfate there would be a quarter ton of ammonia, i.e., \$8.00 worth. Assuming that the selling price of fertilizer grade ammonium sulfate is \$30.00 a ton, deducting the manufacturing costs of a quarter ton of ammonia (\$8.00), there is a clear credit of \$22.00 for every ton of ammonium sulfate. Per pound of copper, this is a credit of about 4 cents, which would yield a clear net profit, over and above the cost of processing the copper, of about one and one tenth cents. Looking at it another way, this credit excess will completely amortize the \$5,000,000 ammonia plant investment in about two years.

This sort of estimate is typical of the advantages of combining the techniques of industrial chemistry with the metallurgical industries.

### Bright Future

There is an interesting future for this approach to metal extraction. In normal business times, demand for metals has risen steadily in this century. The trend is toward working lower grade deposits to meet this demand. For instance, disseminated copper assaying .7 percent in ore, is now economically feasible to process. It is not expected that these new techniques will lower metal prices noticeably, but rather will bring new, lower-grade resources into the booming and expanding market for all metals. Chemico hopes to bring into the category of commerce a number of so-called difficult ores sometimes found not only amenable to treatment by the Chemico Metal Techniques, but very attractive profit-wise. Many new metals, too, are becoming important, such as cobalt, titanium and germanium.

Here have been discussed the economics of the metals for which processes have been developed to the point where they are ready, and in fact, on the road to significant commercial application. Work has also been done on a long list of other metals including precious metals, and when new projects and new demands arise, the Chemico Metal Techniques will be in the picture.



Finished product is pure metal powder

# 1953 Coal Show

## Cleveland Again Host to Biennial Coal Convention and Exposition of American Mining Congress

MAY 11 to 14—these are the dates set for the 1953 Coal Show. The scene will be Cleveland's Public Auditorium. Among those attending will be progressive-minded mining men from miners to company presidents. They will gather from every part of the United States as well as from many foreign countries.

Headed by R. E. Salvati, president, Island Creek Coal Co., the National Program Committee met in Pittsburgh, Pa., on November 19 to formulate a program for the four-day meeting. This committee is made up of coal mining men, prominent as leaders in operation, in management and in manufacturing the equipment and supplies that make possible the enviable production and safety records of American mining. The program drawn up by these men reflects their broad experience in every phase of deep and strip mining and coal preparation, and their insight into the major economic and operating problems facing the industry. Attendance at convention sessions will be a "must" for every mining man.

Each Exposition has been bigger than the last and the 1953 Coal Show is no exception. There will be more than 130,000 sq ft of exhibit space and more than 250 exhibiting companies. Each exhibit will be manned by top engineers and specialists in the mining applications of the equipment on display, who will be glad to answer questions and discuss specific problems.

Although directed primarily to coal mining and preparation, much of the equipment on display will have direct application to the mining and treatment of metallic ores and nonmetallic minerals. A cordial invitation is extended to producers of metals and industrial minerals to again visit the Cleveland show.

Hotel reservations will be handled by the Cleveland Housing Bureau, 511 Terminal Tower, Cleveland 13, Ohio. Now is the time to make reservations.

As usual, many operating companies will send key officials and supervisors and many others of their operating personnel and technical staffs. The executives, engineers, superintendents,



R. E. Salvati  
Chairman  
National Program Committee

foremen, electricians and others who make up the Coal Show crowd will be looking for all the ideas and information they can get in the meeting rooms and exhibition halls. They will also join together in a spirit of good fellowship at the various social and entertainment functions traditional at the Coal Show. Mining men work hard; but they play hard, too. So come to Cleveland next May prepared to learn a lot and to have the "time of your life."

## Program Committee

### National Chairman

R. E. SALVATI

President  
Island Creek Coal Co.

I. N. BAYLESS, Union Pacific Coal Co.  
R. K. BEACHAM, Fairview Collieries Corp.  
S. M. CASSIDY, Consolidation Coal Co. (Ky.)  
H. J. CONNOLLY, Pennsylvania Coal Co.  
J. M. CONNOR, Allegheny Pittsburgh Coal Co.  
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JOHN GRAHAM, American Steel and Wire Div., U. S. Steel Co.  
ALEX GRANT, Buckeye Coal Co.  
CECIL M. GUTHRIE, Sinclair Coal Mining Co.  
R. W. HERNLUND, Western Machinery Co.  
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F. P. KERR, Eastern Coal Corp.  
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H. C. LIVINGSTON, Traux-Traer Coal Co.  
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A. R. MATTHEWS, Pocahontas Fuel Co.  
T. F. McCARTHY, Clearfield Bituminous Coal Corp.  
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L. O. MILLARD, Link-Belt Co.  
FRANK E. MUELLER, Roberts & Schaefer Co.  
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H. H. PANCAKE, American Car & Foundry Co.  
W. J. PARTON, Lehigh Navigation Coal Co.  
R. G. PFAHLER, Berwind-White Coal Mining Co.  
JAMES REILLY, Hanna Coal Co.  
S. F. SHERWOOD, Central Indiana Coal Co.  
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This S-A System of belt conveyors moves iron ore from receiving hoppers through crushing and grading operations to storage, then reclaims the ore from storage and loads it into rail cars at rates up to 500 tons per hour. A 500-foot belt conveyor on an elevated trestle has a self-propelled belt tripper that discharges ore into any desired storage area.

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You know how much more it now costs to mine and clean coal, how hard it is to pass along higher costs in today's markets.

But *do* you know how much these increased costs can be offset by more efficient cleaning? Do you know *how much more coal you could now ship* if your cleaning plant could closely duplicate the washability curves of your coal?

Lost coal is lost profit. And at present costs and selling prices, cleaning efficiency can be the difference between a profitable operation and a "marginal mine."

Immediate practical answer? Based on the operating records, the unassailable answer is *true Heavy-Media Separation*.

Alone among cleaning processes, Heavy-Media Separation can closely duplicate the washability curves of your coal at any gravity from 1.25 to 2.50 over a full size range from 8" to 3/32". You set the gravity of the Heavy-Media "pool" for the quality your market demands. From then on, the Heavy-Media Separation unit automatically separates true float coal from unwanted refuse; continuously maintains the optimum separating

gravity within  $\pm$  0.01; recovers and reconditions the medium and feeds it back to the separating pool. No matter how large and variable the refuse content of the raw feed, your Heavy-Media Separation unit recovers the shipping grade coal you mine—quietly, continuously, efficiently. Even on feeds with a high percentage of near-gravity boney coal, "misplaced material" is held to the very minimum.

### HIGH RECOVERY ON HARD-TO-CLEAN FEEDS

Treating refuse from other washers and dumps containing only 15% coal, a Heavy-Media Separation plant recovers over 90% of the coal in this feed... actually recovers a higher percentage of coal from refuse than other methods recovered from the original raw feed.

Another Heavy-Media Separation unit is fed middlings and refuse containing up to 70% unmarketable material. Although the easy-to-separate fraction has already been removed, the Heavy-Media Separation unit makes a profitable separation, yielding a large tonnage of a marketable coal and a final high-ash refuse.

Building or modernizing a washer is a once-in-a-decade project. Why cut corners on first cost when the separating efficiency of the process you adopt will affect your net profit so much for so many years to come. Remember—no other cleaning process matches true Heavy-Media Separation in separating efficiency. No other

Another Heavy-Media Separation plant cleans 275 t.p.h. of total-seam mine feed containing as much as 44% refuse due to the inclusion of a heavy band of draw slate. Clean coal recovered averages 55%-60% of the raw feed, while Heavy-Media refuse (sink) going to the dump contains less than 1% marketable coal.

Still another Heavy-Media Separation unit treats refuse from mechanical cleaners containing only 30% to 50% recoverable coal. Heavy-liquid tests show that float-in-the-sink and sink-in-the-float average  $\frac{1}{2}\%$  respectively.

process provides constant control, conditioning and recovery of the separating medium for maximum recovery of specification coal.

Your request for specific information on what Heavy-Media Separation can do on your coal will get prompt attention from a nearby Cyanamid Field Engineer.

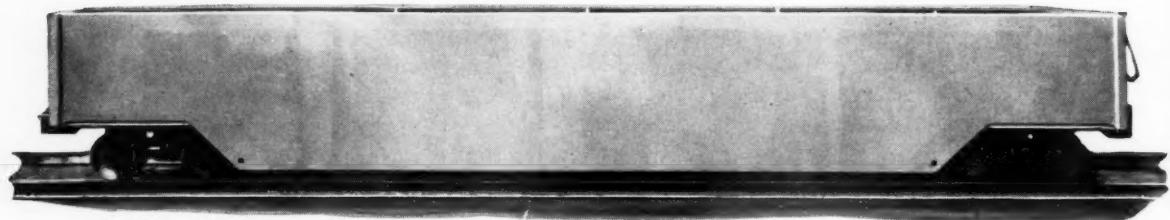


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In spite of its low, graceful, streamlined appearance, this is really a big brute of a mine car. It's a giant with a giant's strength. Holds 17 tons—easily—and won't go to pieces after a brief term of service. This big fellow is built to carry the tonnages year after year.

Designed for use in bituminous mines, it is equipped with cast-steel, high-speed trucks, automatic couplers, roller bearings, eight forged wheels, and body of Mayari R corrosion-resisting steel. It's a Bethlehem-built model that has already proved its economy and

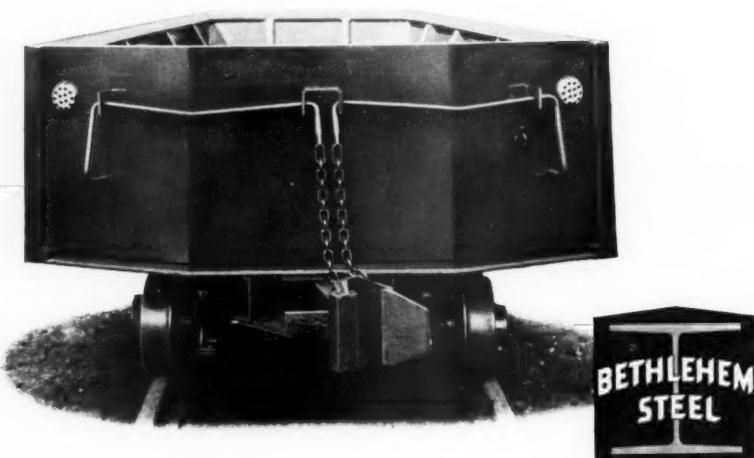
overall value in coal mines with high-production schedules.

Bethlehem of course builds many other kinds of mine cars, large and small. There is often a definite need for the smaller type of car, especially in anthracite mining, and we are well equipped to produce such units in quantity.

Always feel free to talk with us about your haulage problems. Our engineers will gladly co-operate in matters involving car design and construction.

BETHLEHEM STEEL  
COMPANY  
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation *Export Distributor*: Bethlehem Steel Export Corporation.





Mechanization demands efficient power distribution systems

# Trends in Electric Power Use in Coal Mines

**Increased Efficiency in Mine Operation Indicated by Decrease in KWH Used Per Ton of Coal Produced**

By **HARRY P. MUSSER, JR.**  
West Virginia Engineering Co.  
Charleston, W. Va.

ELECTRIC power and the system by which it is distributed to the various mine installations provides the heartbeat and arteries of any modern coal mine. It naturally follows that trends in the use and cost of this power should be of vital interest to the men in every echelon of coal company management.

Data discussed in this article are based upon the annual Analysis of Power Costs for Coal Mines which has been prepared each year since 1918 and in its present form since 1923 by engineers of West Virginia Engineering Co. This survey covers an average of about 200 mines in the states of West Virginia, Pennsylvania, Kentucky, Virginia, and a few mines in Ohio and Maryland. The mines included in the 1951 survey produced over 52,000,000 tons of coal, making the figures typical and authoritative. Table I contains a portion of the data from the annual surveys for the period 1927 to 1951. To save space, only those tonnage classifications relating

to mines producing more than 10,000 tons a month are shown.

The fourth column of Table I, (Load Factor in Power Cost) shows load factor based on demand. Load factor is a vital consideration due to the structure of present-day power rates. A large percentage of any coal mine power bill is the demand portion, the remainder being the energy portion. Load factor is the ratio of the average rate of power use to the maximum rate of power use. For example, assume that a coal mine power bill shows:

150,000 kwh used during the month, and that 500 kw was maximum demand registered. Then, since there are 730 hours (average in a month)

$$\frac{150,000}{730} = 205 \text{ kw, average hourly rate of power use.}$$

Therefore, by definition, the load factor is

$$\frac{205}{500} = 0.411 \text{ or } 41.1 \text{ percent}$$

If the demand portion is relatively low, the load factor will be improved. The effect of a good load factor is to reduce the total cost of each kilowatt-hour used because of the inclusion of less demand cost in its total cost.

Over the years, there has been no consistent trend in load factor in any of the tonnage classes. However, it is significant to note that all the tonnage groups showed improved load factors in 1951. The absence of industry-wide work stoppage contributed largely to this more efficient performance. It also points up management's growing awareness of the direct relationship between load factor and mine power cost.

## Using More Power

The power required to produce a ton of coal ready for market is shown in the sixth column of Table I (kwh per ton). These figures clearly show that from 1927 to 1950 a steady trend toward increasing mechanization took place. More machines were used underground and larger cleaning plants were built. The figures for 1949 are not typical and must be qualified because of the excessive idle periods, due to strikes or shortened work weeks. While not necessarily indicative of a trend, it is interesting to note that the kilowatt-hours per ton for 1951 decreased in all four tonnage classes shown. Perhaps these figures indicate more efficient operation since there has been no decrease in the trend to mechanization.

While more and more electricity was being used to mine and prepare a ton of coal, the cost of each kilowatt-hour steadily declined until 1947 when the cost either held steady or increased slightly. Since 1947 any increase in cost per kilowatt-hour was usually due to the fuel clauses in the power rates. The relative decrease in cost of electric energy compared to the extreme increases in the cost of almost every other commodity is truly remarkable. This performance by the electric utility industry during the period of advancing costs was accomplished by generating power more efficiently. Column 8 in Table I shows that it took 1.92 lb of coal to generate one kwh of electricity in 1927; in 1951 it required only 1.14 lb. Therefore, the increasing use of electricity to replace animal or human labor at the mines has utilized the one product which is relatively inexpensive. However, costs generally have risen so much that power rate increases will be inevitable.

### Cost Per Ton Steady

The all important power cost per ton (Column 7, Table I) remained almost unchanged from 1927 to 1947 due to the increasing use of energy per ton coupled with the decreasing cost of energy per kilowatt-hour. Since 1947 the power cost per ton has advanced since the trend to increased use of kilowatt-hours per ton continued while the decrease in energy cost was halted.

Five of the six tonnage classes used less substation capacity to produce the 1951 coal output. This same trend existed in 1950 and indicates that the substation capacity is being more fully utilized. To further substantiate this conclusion, five of the six tonnage groups showed increases in dc horsepower connection per kilowatt of substation capacity.

Load factor, based on connected load, is the ratio of the average rate of power use to the rate of power use that would occur if all of the mine

equipment were operated simultaneously at full load. Thus it is an indication of the efficiency in the use of equipment or to the degree that the full capacity of the machinery was utilized. For example, assume:

100,000 kwh used during one month, and that

1000 hp = total hp connected at mine

1000 hp = 746 kw

Since there are 730 hours (average) in a month,

$\frac{100,000}{730} = 137 \text{ kw} = \text{Average rate of power use}$

Therefore, by definition, the load factor based on connected load equals:

$\frac{137}{746} = 0.1836 \text{ or } 18.36 \text{ percent}$

If load factor is used with no designation as to whether the basis is demand or connected load, it is always assumed that the basis is demand and is so used throughout the utility and

TABLE I  
POWER COSTS OF COAL MINES—26-YEAR PERIOD—1927-1951

No. of Mines	Average Monthly Tonnage	Load Factor Based on Demand	Cost Per kwh (Cents)	Kwh Per Ton	Power cost Per ton Coal (Cents)	Coal per* Kilowatt Hour Pounds
10,000 TO 20,000 TONS MONTHLY						
1927	39	14,075	31.99	2.13	4.47	9.54
1930	49	14,545	32.88	2.00	4.73	9.48
1935	45	14,050	29.57	1.83	5.41	9.88
1940	41	14,433	33.19	1.71	5.48	9.37
1945	43	14,443	36.01	1.68	5.97	9.49
1947	48	14,568	35.52	1.53	6.85	10.49
1948	51	14,915	34.33	1.60	7.54	12.03
1949	61	14,122	28.57	1.70	8.76	14.90
1950	48	14,498	30.21	1.70	7.41	12.61
1951	40	14,945	31.89	1.64	7.36	12.11
20,000 TO 30,000 TONS MONTHLY						
1927	27	24,106	40.86	1.86	4.28	7.97
1930	24	25,000	35.49	1.85	4.50	8.33
1935	36	24,684	33.43	1.67	5.33	8.93
1940	33	24,946	38.14	1.46	5.62	8.19
1945	36	24,585	39.44	1.51	6.31	9.14
1947	35	24,649	37.22	1.44	6.03	8.71
1948	29	25,035	35.95	1.53	6.83	10.44
1949	20	23,683	34.16	1.53	9.59	14.70
1950	37	24,246	33.11	1.60	8.22	12.82
1951	36	24,584	34.69	1.56	7.81	12.16
30,000 TO 60,000 TONS MONTHLY						
1927	22	40,039	46.94	1.75	4.19	7.34
1930	31	40,157	39.30	1.69	4.36	7.35
1935	18	39,640	37.68	1.61	5.08	8.16
1940	26	42,340	40.73	1.37	5.54	7.60
1945	26	38,774	43.03	1.42	6.57	9.34
1947	34	40,120	41.03	1.37	6.80	9.35
1948	28	37,632	39.25	1.46	7.25	10.57
1949	18	40,442	35.13	1.44	9.08	13.10
1950	18	41,117	38.25	1.37	10.22	13.98
1951	26	41,876	40.10	1.35	9.12	12.33
OVER 60,000 TONS MONTHLY						
1927	5	93,599	45.50	1.64	4.35	7.14
1930	6	84,240	43.92	1.50	5.02	7.52
1935	3	67,661	39.66	1.50	4.16	6.23
1940	12	90,090	47.56	1.17	5.69	6.63
1945	15	80,935	49.02	1.22	6.87	8.25
1947	17	99,971	47.31	1.17	6.44	7.52
1948	19	91,210	45.16	1.24	7.50	9.27
1949	10	77,616	46.65	1.21	8.98	10.85
1950	12	80,129	44.56	1.22	8.57	10.48
1951	16	99,054	44.93	1.23	7.64	9.36

\* Coal required to generate one kwh of electricity. Source: Edison Electric Institute.

coal mining industries. The higher the load factor based on connected load, the nearer full capacity machinery is being operated. During 1951 the four smallest tonnage classes showed improved load factors based on connected load while the two large classes showed decreases. This decrease at the larger mines could possibly be due to less efficient use of equipment or failing to fully load the equipment to capacity.

## Mechanization Still Growing

Table II is based on the average seam height for all mines in each average monthly output class. In Table II, the figures reflect the fact that larger mines have more complete mechanization than mines of small tonnage. In the tonnage class averaging about 3000 tons per month, 59 percent of the output was loaded by hand while in the largest tonnage class, averaging about 100,000 tons per month, only 12 percent of the production was hand loaded.

The trend to more complete mechanization at the mines is clearly indicated by the figures in Table III. It should be noted that the column headed "All Mechanical Loading" means literally 100 percent mechanical loading. If even 1 per cent of the tonnage was hand loaded, the mine was included in the "Mechanical and Hand Loading" column. In 1945 only 22 percent of the mines used mechanical loading exclusively. In 1951 the proportion had risen to 50 percent. The increase in number of 100 percent hand loading mines from six percent in 1950 to eight percent in 1951 is not necessarily conclusive because the total tonnage loaded by hand decreased from 26 percent in 1950 to 21 percent in 1951.

The actual importance of mechanical loading in the coal industry is

TABLE II  
MECHANIZATION AT VARIOUS SIZE MINES—1951

No. Mines	Average Seam Height	Average Monthly Tonnage	Percent Hand Loading	Percent Mechanical Loading
15	36 in.	3,352	59 percent	41 percent
25	42 in.	7,588	34 percent	66 percent
40	44 in.	14,945	30 percent	70 percent
36	46 in.	24,584	20 percent	80 percent
26	51 in.	41,876	26 percent	74 percent
16	55 in.	99,054	12 percent	88 percent

TABLE III  
TRENDS IN MECHANIZATION  
IN MINES PRODUCING MORE THAN 10,000 TONS PER MONTH

Year	Percentage of Mines		Percentage of Tonnage		
	All Mechanical Loading	All Hand Loading	All Hand Loading	Loaded Mechanically	Loaded By Hand
1945	22 percent	57 percent	21 percent	52 percent	48 percent
1946	29 percent	58 percent	13 percent	60 percent	40 percent
1947	31 percent	56 percent	13 percent	63 percent	37 percent
1948	31 percent	61 percent	8 percent	64 percent	36 percent
1949	37 percent	56 percent	7 percent	71 percent	29 percent
1950	44 percent	50 percent	6 percent	74 percent	26 percent
1951	50 percent	42 percent	8 percent	79 percent	21 percent

TABLE IV  
RELATION BETWEEN  
MECHANIZATION, SEAM HEIGHT, AND POWER COST  
1951

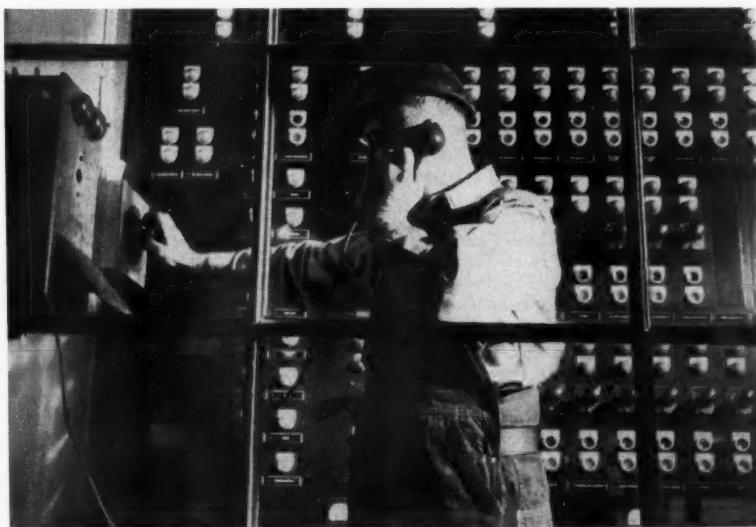
No. Mines	Average Monthly Tonnage	Average Seam Height	Percentage Mechanical Loading	kwh Per Ton	Power Cost Per Ton
15	3,352	36 in.	35 percent	10.4 percent	20.4 cents
25	7,588	42 in.	63 percent	8.6 percent	15.4 cents
40	14,945	44 in.	68 percent	7.4 percent	12.1 cents
36	24,584	46 in.	78 percent	7.8 percent	12.2 cents
26	41,876	51 in.	74 percent	9.1 percent	12.3 cents
16	99,054	55 in.	84 percent	7.6 percent	9.4 cents

reflected most accurately in the columns showing the percentage of the total tonnage loaded mechanically. In 1945 this was 52 percent, but by 1951 had increased to 79 percent.

As in Table II, Table IV is based

on average height of seam for all mines in average monthly output class. It will be noted from Table IV that the relationship between monthly production and seam thickness is direct: that is, as the seam thickness increases, the tonnage increases. It would be wrong to assume that increased production was the natural result of thicker seams without considering the factor of mechanization. Since high coal permits greater mobility for equipment, more mechanization is found in the large seams, thus resulting in greatly increased production. Therefore, monthly output expands with mechanization, which in turn is more prevalent in thicker seams. Also it is significant that large mines with a high degree of mechanization and efficient power use (kwh/ton) have the lowest power cost per ton.

The pressure of increasing costs has forced the price of electric power per kilowatt-hour either to halt its downward trend or to increase, due to fuel clauses in the power rates or to rate increases. In spite of this, it is still economical for coal company management to use increasing amounts of electricity and to continue to mechanize.



Electricity is the lifeblood of the modern coal mine



A new forest nearly ready for harvest has sprung up on lands logged 60 years ago for the Butte mines. This is part of Anaconda's tree farm

# Western Mines Grow Own Timber on Tree Farms

**Forward Looking Managements Perpetuate Timber Supply**

By HAROLD OLSON

American Forest Products Industries, Inc.

NEARLY 60 years ago Marcus Daly took a long look beyond the fabulous hillside at Butte and noted an endless procession of timber-laden cars streaming to the mines from western Montana forests. They carried poles and planks, props and lagging, ties and wedges—lumber in a hundred forms. Daly saw the mines swallow these products in prodigious quantities and keep on asking for more. It was obvious to him that an unfailing timber supply was indispensable to mining so long as there was ore to be brought up out of the Butte mines.

Daly made a bold and far-reaching decision. He put the Anaconda Copper Mining Co. into the timber business. Under his guidance the company acquired a sawmill at Bonner, Mont. and substantial forest holdings all around to back it up. Thus the wood supply line protecting the Anaconda

operations became part of the mining operation itself.

How Daly's judgment was viewed at the time is not recorded, but it certainly sparkles today in the light of what has happened in the past half century. Colossal volumes of wood have gone into the mines in that time. Butte has towered mightily in America's fighting machines of two world wars, and is just as vital in peacetime production. There has been great progress in mining, but wood is just as important now as a tool of mining as it ever was. Today, for every ton of ore hoisted at Butte, 14.7 fbm (board feet) of wood in some form goes into the workings. Requirements seem to grow, rather than drop. Yet the source of supply continues ample. The forest of western Montana still stands deep and strong in support of the mines.

At this writing more than 535,000 acres owned by four mining companies are being managed as tree farms primarily to maintain mines. In addition to Anaconda, the Homestake Mining Co. of South Dakota, Bunker Hill and Sullivan Mining & Concentrating Co. of north Idaho, and Northwestern Improvement Co., a subsidiary of the Northern Pacific Railway Co. in central Washington, all operate certified western pine tree farms growing crops of wood. Other mining firms are embarking on similar programs.

A tree farm, it might be explained, is an area of privately owned forest land given over to growing trees as a business. The tree farm sign is the emblem of a nationwide movement. Started in 1941 in western Washington by the lumber industry, the program is based on the idea that new timber can be grown profitably where nature produced the virgin stand. The idea is working out fine, and spreading. Mining firms were among the first to participate.

## **Homestake Points the Way**

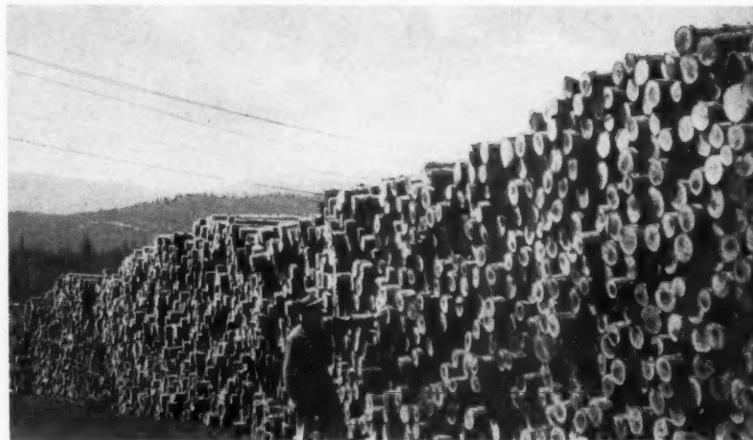
Homestake Mining Co. in South Dakota's Black Hills is a most interesting example. This world-famed gold

mining enterprise, integrated forest and mine long ago. Its 57,577 acres of pine woods, certified early in 1952 as an official Western Pine Tree Farm, had been managed on a timber crop basis at least 31 years prior to that.

Teamed with other private lands and the national forest with which it intermingles, Homestake's tree farm is designed to be not only an ample, dependable and endless source of timber for the mines, but also of lumber and other forest products—to say nothing of payrolls—for the locality and region.

To meet specific needs of its mines at Lead, S. D., Homestake operates a modern, electric sawmill at Spearfish, S. D. Employing some 180 men the year around, the timber operation produces annually 30,000 to 40,000, 12 by 2-in. timbers, 80,000 to 90,000, 6 by 8-in. track ties and lagging, and a host of lesser wood items for the mines. Hand in hand goes commercial lumber manufacturing, averaging 8,000,000 fmb a year. In addition, from slabs and other log parts unsuitable for mine products or lumber, the mill turns out 1,500,000 lath, 2,000,000 lin. ft. of moulding, 275,000 lin. ft. of wire-bound snow fence and slat cribbing, 10,000 tons of fuel wood, large quantities of grain doors for railway boxcars, survey stakes, butter tub stock, fence posts, corral poles and other products. Something useful from every piece of wood cut in the mill is the aim, according to C. A. Polley, manager of the Timber Division.

Out in the woods, Homestake has long operated with sustained yield as the objective. Before any area is touched, foresters go through and carefully mark ripe, over-ripe and insect-infested trees for harvesting. Healthy, fast-growing trees are left to put on more wood. Open spaces



The storage yard at Roslyn coal mine of Northwestern Improvement Co. holds a fine supply of posts and cross-bars

left by removal of big oldsters are thus given a chance to reforest naturally, which is what has occurred there with clock-like regularity.

"We believe in keeping our lands and managing them for timber crops to support our mines and our communities," said general manager Guy N. Bjorge. "By selective logging in mature stands and thinning in thick young stands we can make the best possible return per acre while at the same time assuring productivity of the forest for tomorrow."

During the depression Homestake, wanting to keep its men busy, took work teams out in the woods to thin out pine thickets where saplings stood too densely for their own good. Out of this came a wonderful growth. In 1952 Homestake forester, Richard Marden, and Western Pine forester, Hanley Morse, took measurements in the thinned areas and found the stands

had made an average annual net growth of 487 fmb per acre on the best land over the past ten-year period. On less favorable sites, the growth was 240 fmb per acre per year. Even that is a commanding figure. Thinnings too small for mining timbers are sold as posts and poles to local treating plants and pulpwood to paper mills in the Lake states.

Complementing its policy of sustained yield production, forest conservation and full utilization, Homestake's mining department has striven constantly to improve its mining methods and thereby reduce the amount of lumber and timber products required per ton of ore mined.

"In 1939," Mr. Bjorge pointed out, "there were 9.7 fmb consumed per ton of ore mined. In 1951 this had been reduced to 6.2 fmb per ton. Changes now in progress promise still further savings."

Like all forest, the Black Hills woods has three major foes—fire, insects and disease. Private, state and federal forces work together in protection against these enemies. Organized, systematic protection is the order of the day. Fire prevention education is likewise widely promoted, through the "Keep South Dakota Green" program.

### Tree Farming in Montana

In Montana mining and timber go hand in hand. The Anaconda Copper Mining Co. of course is in the mining business, first and foremost. The forests make deep mining possible. So the company, to make sure, buttressed the mines with one of the largest single private forest land blocks in the state. Four certified Western Pine Tree Farms totaling 330,370 acres stand squarely back of the Butte workings.

The four tree farms are Clinton-Potomac, 81,918 acres; Belmont-Gold Creek, 40,325 acres; Fish Creek, 25,276 acres, and Thompson River-Pleas-



Homestake Mining Co.'s timber originates here, in Black Hills Forest



Steel-strapped bundles of timber ready to go underground at Bunker Hill and Sullivan

ant Valley, 180,851 acres. Logs from these lands, augmented by purchases of public and other private timber, support the Anaconda's lumber department at Bonner, Mont., where about 90,000,000 fmb of forest products are manufactured annually. About 45 percent of this output goes to Butte.

The 40,000,000 fmb that Bonner sends to Butte in an average year represents enough lumber to build 4000 dwellings. Hauled in one shipment, 15 freight trains of 100 cars each would be required to move it all. Yet, the lumber department, has the resources and know-how to produce what's needed, year after year, with roughly half its output available to the public.

H. F. (Jack) Root, general manager,

has been with the lumber department since he was a striping. A staff of five professional foresters helps George Neff, land agent, in handling the tree farms. Neff himself is a forestry graduate of Montana State University.

Neff's men precede the loggers into stands to be opened. They mark trees that should come out. Maturity, state of health and life expectancy are the main criteria. Vigorous young trees are passed by. This system not only makes for a dynamic, growing forest, but for an insect-resistant forest as well, for strong young trees are better able to ward off destructive bugs.

At Bonner hundreds of mine items are produced. All standard propping and cribbing materials flow east in huge volume, plus specialty items like

huge spools on which Butte copper is wound for the trade, and dozens of others. Converter poles, used for fluxing metals, are a time-honored product from forest to mine.

### Bunker Hill Grows Trees

Mining companies regard it as good local policy to buy poles, logs and other forest materials, raw or finished, from sources outside their own operations. This not only provides income for enterprising small tree farmers and timber contractors, but it helps spread over more forest acres the load of supplying the mines. In Idaho's Coeur d'Alenes, the Bunker Hill and Sullivan Mining & Concentrating Co., with a newly certified 14,838-acre tree farm, currently gets the bulk of its log needs from other lands in the vicinity.

One of the famous old lead-zinc-silver mines of that productive region, Bunker Hill and Sullivan, is engaged in building up the growing stock on the tree farm and expects eventually to draw heavily again on the timber production of these lands. Some hand planting of little timber trees grown at the nursery at Moscow, Idaho, has been done on lands denuded by repeated fires. More planting, where needed, will follow in the wake of progress in removing plant-harmful chemicals from Kellogg smoke.

First planting was done in cooperation with older Boy Scouts to encourage their interest in the forest and timber resources. It is important for coming generations to know something of this subject, for annually the Coeur d'Alene mining district consumes 30,000,000 to 35,000,000 fmb of timber in mining operations.



Spearfish sawmill at Lead, S. D., where logs are transformed into mine timber

"Our plans," said Ira A Robson, assistant secretary who heads up the reforestation and tree farm program, "is to increase plantings gradually each year as we gain experience and knowledge of how the work can best be handled. Our experience with the Boy Scouts was very good, and I am hopeful in future years we can continue with this plan to a certain extent; possibly giving them a certain area which they can feel is theirs for the purpose of reforestation."

In addition to the Tree Farm in three units—Bear Creek, Pine Creek and Latour Creek—Bunker Hill is helping maintain other large areas of young forest growth which will eventually be placed under the tree farm program. The company is particularly interested in maintaining continuous crops of mixed timber species in the working area for mining purposes.

### Trees Aid Railway Coal

Still farther west, the Northern Pacific Railway's Northwestern Improvement Co., with a number of coal mines at Roslyn in central Washington state, operates the 132,946-acre Upper Yakima Tree Farm with a triple mission—water for irrigation, timber for the mines and logs for local forest industries. P. D. Edgell, western land agent for the Northern Pacific Railway Co., estimates that it takes two acres of wild land on the tree farm to store enough water to support one acre of crop land in the Yakima Valley. Also, it takes 11½ fmb of timber to produce a ton of Roslyn coal.

In an average year the NWI mines put out a half million tons of coal and use 5,600,000 fmb of timber. Since 1886 when mining began in the Roslyn field, about 57,000,000 tons of coal

### Plantings at Utah Mine

Down near Lark, Utah, still another mining company has taken note of burgeoning tree farm activities. United States Smelting Refining and Mining Co. last spring planted 10,000 tiny pine trees on lands it owns. If they do well, the company hopes to plant more until a full-fledged forest has replaced today's brush fields. It may take 30 or 40 years for the trees to start yielding returns, but the company regards it as good business anyway to make the land productive. The plantation is not certified yet as a tree farm, but it can be any day.

The four mining companies already in the tree farm program have certificates issued by the Western Pine Association, a group of lumber manufacturers that spearheads tree-growing action on private lands in the pine



Timber for Anaconda Copper Mining Co.'s Butte mines is loaded at one of its tree farms

"Mixed timber" means a good percentage of the structurally stronger species preferred in the mines.

The company operates a sawmill at the mine, cutting about 4,500,000 fmb of logs a year, all for the workings below. The sawmill operation is as old as the mine, for Bunker Hill learned long before the turn of the century that it takes some 15 fmb of timber to get a ton of ore to the surface there. Wood in some form goes into the mine every day.

Bunker Hill has hired a forester, Wallace Kenyon, schooled at the University of Idaho, to intensify its tree farm activities. Tom Kinney, who heads up the timber and lands program, is an enthusiast on tree-growing opportunities of north Idaho. The program has powerful inside backing from Stanly Easton, president; J. B. Haffner, general manager and others high in Bunker Hill and Sullivan management.

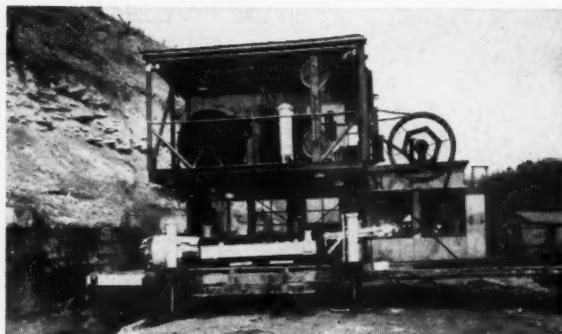
have been taken out. It required about 370,000,000 fmb of timber—enough to build homes for a city of 120,000 people—to make that coal production possible.

In Northern Pacific's train operations coal doesn't cut the figure it once did but the Roslyn mines have found new markets at home and overseas. Output continues on an average level, and NWI's own little sawmill at Roslyn keeps right on making lagging, ties, stulls, collars, wedges, lumber and a host of special products needed by the miners. Upper Yakima Tree Farm can supply the mine's needs easily, with millions of feet of logs to share for forest industries nearby. Were more wood needed for the mines, N. P. knows where to get it, for the road has four more tree farms—three in Montana and one in western Washington. All are being operated on a crops basis, and the railroad also has its own continuing needs in mind as it plans for tomorrow.

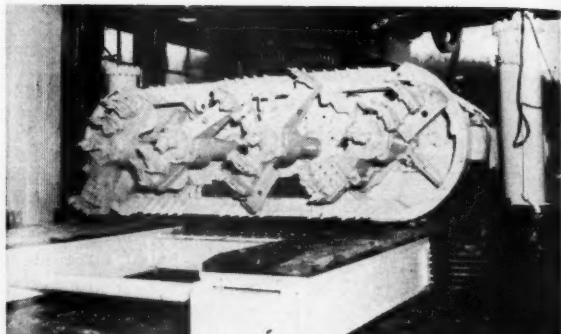
region of 12 western states.

In the Douglas Fir region of the North Pacific coast the West Coast forest industries—lumber, pulp, plywood, etc.—do the certifying and carry on inspection service to maintain integrity of the program. In the Redwood region it's the California Redwood Association. Elsewhere, various industrial groups and state foresters manage the movement. American Forest Products Industries, Inc., representing forest industries on a coast to coast scale, encourages the program everywhere. The 11-year-old movement has spread to 34 states, and now lists nearly 3800 tree farms totaling 26,000,000 acres.

Western mining companies, says AFPI, are pace setters in this huge new crusade of private enterprise to grow timber crops for tomorrow. They are helping to show that private owners can do their part in maintaining the Nation's wood supply.

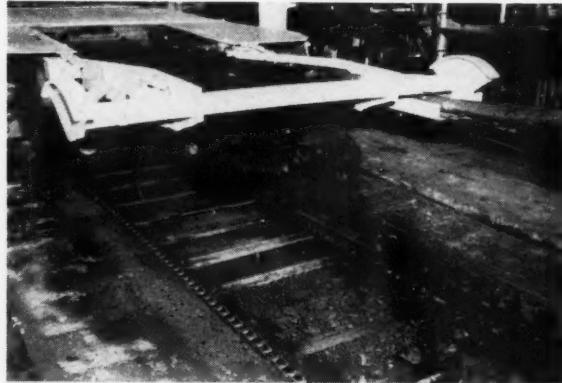


Standing solidly on four jacks, new rig is ready to advance into coal face

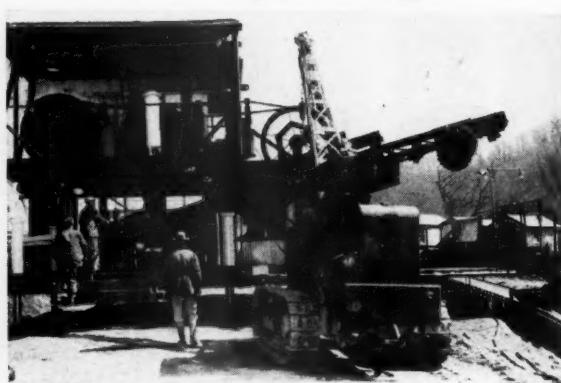


Four overlapping cutter heads and fixed cutter blades at top and bottom chew their way through coal seam

## Carbide and Chemical Co. Develop New Mining Rig



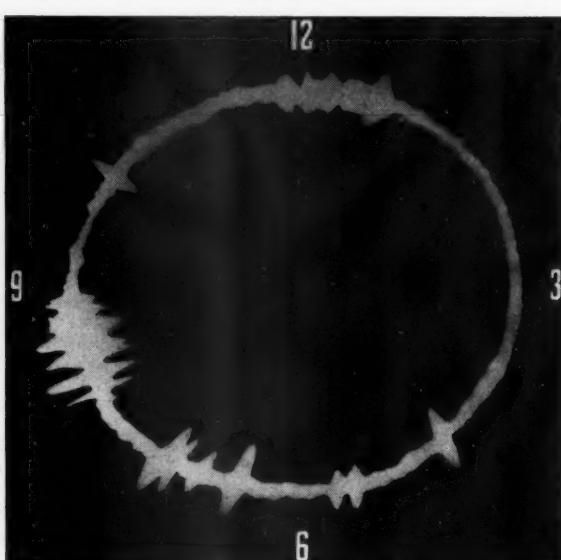
First cuttings drop from central flight conveyor of mining machine to conveyor on deck of launching platform



Crane positions 30-ft portable belt conveyor above launching platform



"Stratascopes" are mounted on outermost cutting teeth of the two outside cutting heads



"Blips" on oscilloscope screen in control cabin tell operator just where cutting head is in the coal bed

## Machine to Mine Outcropping Coal Seams is Operated by Remote Control

IN the mining of outcropping coal seams a point is always reached where it is no longer economical, or safe to remove the overburden above the coal. The problem then faced is to find a means of recovering the rest of the coal inside the hill.

In the past this was often done by resorting to underground methods through entries driven off the bench left by strip operations. Such a procedure meant leaving sufficient coal in a barrier pillar to protect the entries driven into the hillside. For a long time it was not considered feasible to recover this coal at all. It represented a "fringe" zone which could not be mined by either strip methods or by underground methods.

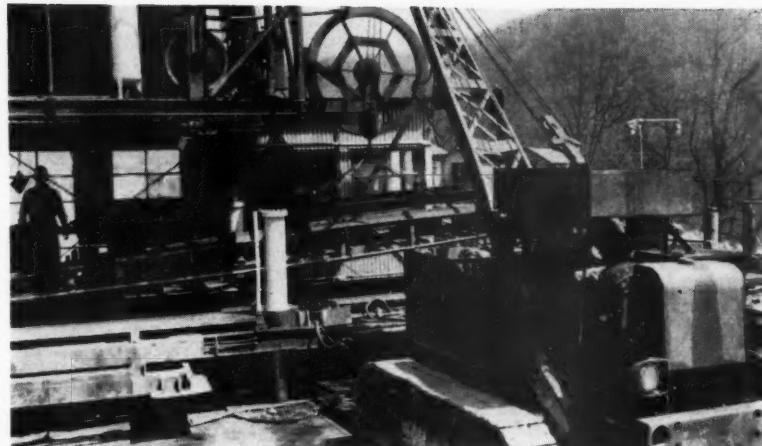
Then came the large size coal auger with diameters up to 60 in. They penetrated up to 200 ft into the bank and permitted a theoretical recovery of up to 75 percent of the coal in a pillar that deep. However, due to the length of the auger flights, it is necessary to mine from a bench at least 65 ft wide.

### Develop New System

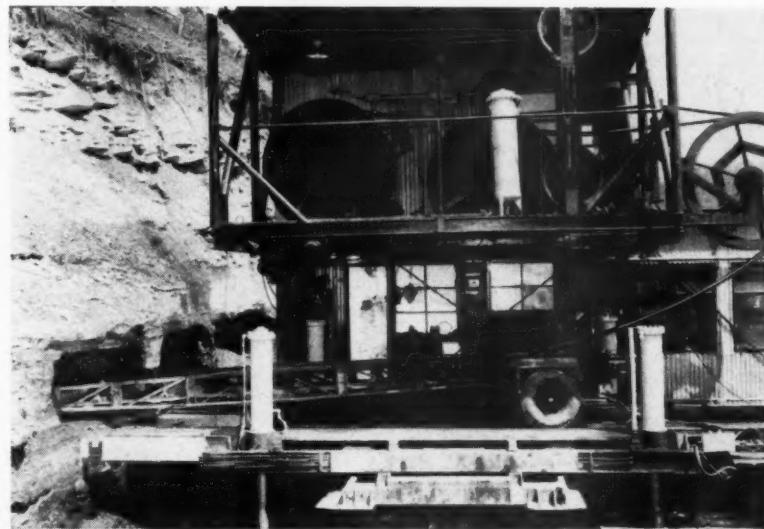
In a fresh attack on the problem of mining coal in outcrop seams Carbide and Carbon Chemicals Co. has developed a new continuous mining system. Preparation for mining such a seam with the machine this company has developed is relatively simple. A working shelf is cleared at the level of the outcrop and the mining rig takes over.

This mining rig is a self-propelled, double-decked steel structure. On the first deck is a runway or launching platform for the mining machine. In the center of the runway is a coal conveyor. Adjacent to it is a control panel for moving the whole rig, and an enclosed cab that houses the remote controls for the mining machine. On the second deck are the cable reels for the power and control cables that guide the machine and electric switch gear.

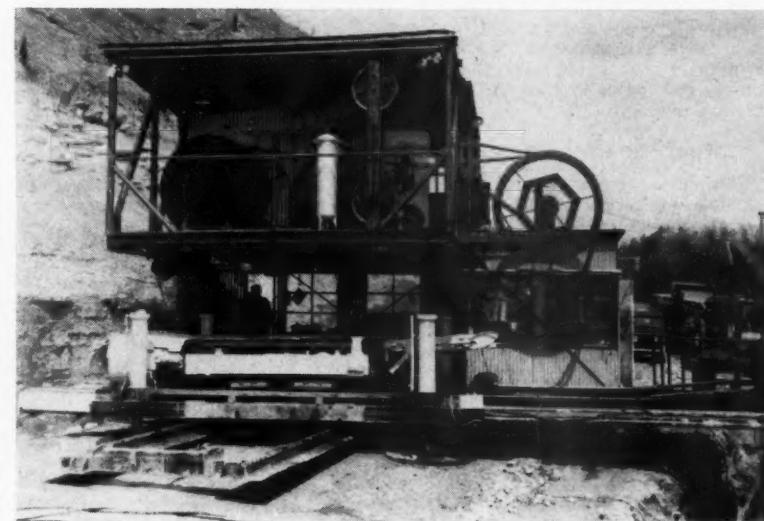
This whole structure is mounted on four hydraulic jacks, which can be adjusted so that the launching platform is at the proper height for the mining machine to enter the seam. In order to move along the face of the seam, these jacks are raised enough to allow rails suspended from the undercarriage to be rolled out by an electrically-driven winch. The jacks are let down until the rig rests on wheels on the rails and the four hydraulic



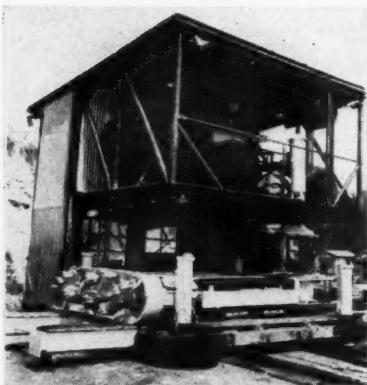
When it is needed portable belt conveyor is lowered to launching platform and attached in a few minutes



Mining machine and part of first conveyor are underground



Rails are lowered and moved out preparatory to moving into next position



With jack pads in the air, cable and power winch pull rig along rails to next mining position

jack pads are off the ground. Then the winch pulls the rig over to the next position. If the exposed face is irregular, the rails can be pivoted until the platform is at the correct angle. When the platform is in position, the hydraulic jacks are raised to support it at the proper height.

The mining machine is mounted on crawler tracks, which are driven by a variable speed electric motor. Its "business end" consists of four overlapping cutting heads with cutting teeth tipped with tungsten carbide. The sections between the holes cut by these heads are shaved off by fixed cutter blades just slightly to the rear of the heads. Between them, the heads and the blades make a smooth, even hole about 10 ft wide and three ft high. By making successive cuts, the full height of the seam can be mined.

Behind the outer cutting heads revolving on the same shaft are paddles that move the coal cuttings to the middle, where they are picked up by the central flight conveyor and carried from the front to the rear of the machine. From the fixed cutter blades back, the whole cutting end is encased in a metal shield, so that the coal can escape only by means of the machine conveyor.

### Steering the Machine

Electric sensing devices called "stratasopes" are mounted on the outermost cutting teeth of each of the outer two cutting heads. In the control cab, the stratasopes are coupled to two polar oscilloscopes having circular screens somewhat like a radar screen. On each a circle of light traces the paths of the two sensitive teeth. Every time the stratascope teeth cut through anything harder than the normal coal in the seam, they cause irregularities—or "blips"—in the light circles. They indicate which strata in the coal seam are being cut, and the relation of these strata to the center of the hole.

Since the strata in a coal seam bear

a more or less fixed relation to each other and to the extremities of the seam, the oscilloscopes give the operator the information he needs to steer the machine on a predetermined course. Then, from his cab on the launching platform, the operator guides the machine up or down to follow the coal seam. He can correct any tendency the machine may have to "spiral," and steer it to make a straight hole, or to follow the adjacent hole at any desired distance.

### Sequence of Mining

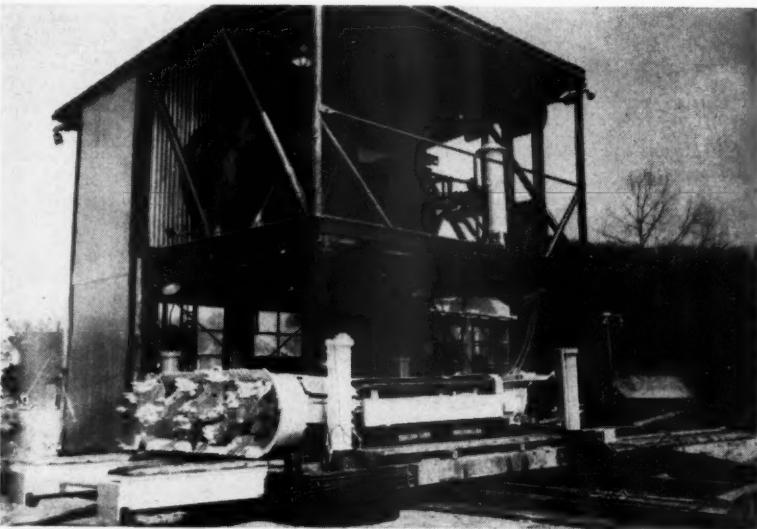
To begin mining, the rig carrying the machine on its launching platform, is located at the proper angle and height. If the launching platform does not abut the seam face, the gap is bridged by extending two telescoped sections of the runway. The operator starts the cutting heads and conveying system, and then moves the machine ahead on its crawler tracks. First, the pilot drill taps the coal and starts

sinking the pilot boring. In a few moments, the main cutting heads reach the seam and begin to bite. They crack the coal into small pieces that are pushed by the paddles and carried up through the middle of the machine on the conveyor.

At the rear of the machine, the coal falls from the central flight conveyor to the conveyor in the launching platform. The continuous stream of coal flows along the rig conveyor to a short transfer conveyor, which feeds the elevating conveyor of the truck-loading hopper. From this point, it travels by 20-ton trucks to the hopper at the let-down conveyor to the storage pile.

### Add Portable Conveyors

When the mining machine is almost underground, the rear of its central flight conveyor reaches the end of the platform conveyor. At this point, the machine is stopped and a portable conveyor is added. Each of these convey-



With pads down machine is ready for next cycle



Truck dumps coal into hopper at let-down conveyor for stockpiling

ors is about 30 ft long and is mounted on two pneumatic tires located at the rear end. The front end of the portable conveyor is attached to the mining machine, which now will both mine the coal and haul the train of conveyors. At the rear of the conveyor, the cable is plugged in to supply power for the belt motor. To prevent fouling or dragging the mining machine power cables, each conveyor has large L-shaped hooks on its side for carrying them as they come down from the reels on the second deck of the rig.

As each portable conveyor reaches the end of the platform conveyor, another is added. Actually, this operation takes only a couple of minutes, because the conveyors are brought in overhead by a tractor-mounted crane that suspends each portable conveyor just above the rig conveyor until it is needed. The number of conveyors added depends on the depth of the hole being bored.

### Taking Second Cut

When the machine has bored as deeply as desired, the electric motors are reversed and the machine *pushes* instead of *pulls* its train of portable conveyors. The train is unhitched just as it was assembled. Finally, the machine itself backs out into the daylight on the launching platform. This part of the operation is much quicker, since the machine can be backed at 30 ft a minute.

If the thickness of the seam war-



Storage pile at foot of hill now contains over 150,000 tons of coal

rents, the four hydraulic jacks are let down until the platform is in position to make a second cut below the first. When the seam is not thick enough to permit a full three-foot bite on the second boring, coal is kept flowing at the same rate by increasing the forward speed of the machine.

When the second cut has reached the depth of the first, the process is once again reversed to remove the conveyors and the machine. With the mining machine on the launching platform, the rig is moved over on its rails so that there will be a pillar whose thickness is determined by roof conditions, between the boring just made and the one to be started. In about 20 minutes, the mining machine is ready to repeat the cycle on a fresh face.

### Some Controlling Factors

When this project was first started, the depth of the holes was limited to 560 ft by the length of power cable. Since then, the cable has been increased to 1000 ft. Right now, the machine is boring 700-ft holes, which is the sum total of the portable conveyors on hand. However, it is confidently expected that this machine could make these 3 by 10-ft holes for over 1000 ft into the hillside.

Variations in the coal face at the outcrop and variations in the seam can dictate the use of different cutting patterns.

### High Production Rate

The operators of this machine are always above ground, and they have little or no actual contact with coal. Yet the underground machine they control sends out by way of conveyors up to a ton and two-thirds of coal a minute. The size of this coal ranges up to four in., and the percentage of fines is not materially different from other coal mined mechanically.

During the machine's best eight-hour shift, 567 tons of coal poured off its conveyor. In one continuous 24-hr day, it has mined 1200 tons, and in one continuous week, as much as 6000 tons. This production represents a recovery of about 65 percent and it seems practical to increase this by devising a means for mining the walls between the holes.

## Mining In Thin Seams

(Continued from page 43)

complete revolution of the chain. In operation, the weight strikes the coal shortly before the second set of chain lugs reach it. Speed of the chain is governed by the throttle speed. At average speed the weight drops four times a minute.

The mechanism that drives the attachment is a power take-off mounted on the back of the tractor connected to a standard power take-off shaft, and a Foote Brothers Model No. 22 gear reducer. To make the machine operate the master clutch is kept engaged and the steering clutch is used for direct propelling of the machine.

Normally, coal is pinned on three-ft centers parallel with the pit. However, when the hardness of the coal increases, the centers are decreased to two ft. Occasionally coal is pinned diagonally. The average thickness of the coal seam currently being loaded is 17 in.

### Coal Loading

With most conventional shovel loaders the arc through which the dipper travels is not flat enough to fill the bucket in one pass through a thin seam. Because the dipper travels in

a horizontal plane, the thrust type loader used here can pick up a full load in one pass. For this reason it is well adapted to thin seam mining. The horizontal thrust type loader is not new, dating back to 1914. One of the first used was the steam powered Keystone Loader.

In 1923, Pittsburg and Midway installed a Bucyrus Erie 30-B Horizontal Thrust Loader at their No. 10 mine near Mindenmines, Mo. It was the first electrically operated loader in the field. In 1938, the 30-B was replaced with the larger, improved 85-B model, which is still in operation at the company's No. 19 mine.

The Bucyrus Erie 85-B Horizontal Thrust Loader consists of a horizontal thrust coal-loading front end mounted on the regular 85-B electric shovel. A boom with two stationary dipper sticks mounted on the sides make up the front end. The dipper mast, which supports the dipper, travels along the sticks, driven by the crowd machinery mounted on the boom. Effective length of the boom is 36 ft, and the effective length of dipper travel on boom is 19 ft. Capacity of the bucket is five cu yd or approximately five tons. The entire boom is hoisted by means of 1 1/4-in. twin ropes run over a vertical mast to the hoist drum.

Coal is dumped by means of a trip

motor that pulls a lock pin. The dipper is so constructed that the weight of the load will overbalance the front end when the pin is released, causing the load to fall forward and out.

The dipper is equipped with six teeth spaced evenly across the front. They are shaped to prevent creeping up in the coal and are usually built up once a week.

Main electrical equipment consists of a 150-hp motor generator driving motor, a 75-hp hoist motor, a 23-hp swing motor, and a 23-hp crowd motor.

An average loading cycle is 30 seconds. Including the sweeping operation, five minutes are required to load the eight dumps necessary to fill the 40-ton semi-trailer used in the haulage operations.

All coal produced at the pit is hauled to a preparation plant. The plant has only been in operation since September 5, 1951. It is one of the most modern plants in the district and was designed and built by the McNally-Pittsburg Manufacturing Corp. of Pittsburg, Kans.

Although better equipment may be developed in the future, at the present time experience has shown that the pinning machine and horizontal thrust loader are playing an important part in making the recovery of thin seam coal profitable.



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**MINING CONGRESS JOURNAL**

[ Page 64 ]





# Wheels of GOVERNMENT



As Viewed by A. W. DICKINSON of the American Mining Congress

THE firm resolve of the men and women of this country to bring about a change in the Administration of their Government has brought forth a Republican President and Republican control, by a narrow margin, of both the Senate and the House of Representatives. Chief Washington interest now centers in the forthcoming Cabinet appointments, which will follow the January 20 inauguration of President Eisenhower, and in the personnel of the important committees of the Senate and the House.

Meanwhile the incoming President's personal representatives, headed by Senator Henry Cabot Lodge, Jr., and Detroit banker Joseph M. Dodge, are conferring with the incumbent officials of the Departments of State, Treasury, and Defense, and with the Bureau of the Budget.

The organizational period in both the Congress and the Executive Branch of the Government will extend well into February of 1953, but resolves are firm and hopes are high that better days lie ahead.

## Taxation

It is beyond question that in view of current Federal expenditures and the accompanying tax burden, the fiscal situation of the United States will receive most careful consideration by the Administration and the 83rd Congress. The excess profits tax is scheduled to expire June 30, 1953; the 10 or 11 percent increase in the individual income tax on December 31, 1953; the 5 percentage point increase in the corporate income tax on April 1, 1954. Various increases which were made in excise taxes expire April 1, 1954.

Taken as a whole these tax increases produce over \$8.3 billion in a full year. What the new Administration and Congress decide to do about these taxes, of course, depends on what can be done toward reducing budget expenditures. It is a proper assumption that every effort will be made to balance the budget, reduce the national debt, and thus to proceed to

ward a stabilized currency and the protection of the credit of the United States.

## Revenue Act Regulations

The Bureau of Internal Revenue has recently made public proposed regulations to govern the depletion, development and exploration provisions contained in the Revenue Act of 1951. These regulations are tentatively scheduled to become effective 30 days from date of their announcement, and meanwhile interested persons may make recommendations for changes which they consider appropriate. The AMC Tax committee is giving careful study to this subject and, as in past years, will present its views to the Bureau.

The depletion regulations deal principally with the new minerals that were extended percentage depletion under the 1951 Act, by providing definitions of certain of these minerals; supplementing and making changes of present regulations as to the meaning of "ordinary treatment processes"; and listing percentage depletion rates and effective dates for all minerals now receiving percentage depletion. The rather voluminous development and exploration regulations are contained in the Federal Register of November 6.

## Coal Wage

On the new wage contracts between bituminous coal operators and the UMWA, the Wage Stabilization Board ruled on October 18, that "an increase of \$1.50 a day is all that can be approved under our regulations and policies." The increase of \$1.90 per shift in the basic underground day wage scale, which the contract provides, was not approved. Later, on October 24, President Harry Moses of the Bituminous Coal Operators Association and the UMWA jointly petitioned Economic Stabilizer Putnam to reverse the Board ruling and approve the full \$1.90 increase. At a White House meeting October 26, at which Moses, John Lewis and Putnam met with the



## Washington Highlights

**CONGRESS:** Control goes to Republicans.

**TAX:** Changes depend on fiscal status.

**REGULATIONS:** Depletion, exploration and development.

**COAL WAGE HIKE:** Awaits Government ruling.

**COAL MINE INSPECTION:** Company appeal denied.



President, Lewis agreed to put the miners back to work while awaiting Putnam's decision.

On November 1 the anthracite industry signed a new wage agreement calling for a \$1.90 per day increase distributed over the anthracite contract rate structure. Effective November 16, this agreement expires September 30, 1953, but runs indefinitely unless terminated by 60-day notice by either party. The anthracite operators have filed an application with the Stabilization Board for approval of the increase.

## Coal Mine Inspection

The Coal Mine Safety Board of Review has denied the appeal of the Morrisdale Coal Mining Co. of Clearfield County, Pa., from a ruling by Federal inspectors classifying its mine as "gassy." The Board acted in accordance with the position taken by counsel for the U. S. Bureau of Mines, who held that the new Coal Mine Safety Act requires the Director of the Bureau of Mines and the Board to uphold the classification of a mine as "gassy" when a Federal inspector finds more than .25 of 1 percent of methane to be present. The company took the position that it should be possible to reclassify the mine as "non-gassy" upon a later reexamination.



# Personals

**Russell G. Haworth**, resident manager of Potash Co. of America, has been appointed vice-president in charge of production in addition to his present position. The appointment was made at the annual reorganization meeting following the stockholders' meeting on October 16 in Denver.

Haworth joined PCA in October, 1942, as mine engineer. Four years later

he was promoted to assistant resident manager. On July 1, 1952, he became resident manager.

**G. Stuart Jenkins** has been named president of the Clarkson Manufacturing Co. at Nashville, Ill. He fills the position left vacant by the death of John L. Clarkson. Jenkins was formerly vice-president of Consolidated Coal Co. of St. Louis and later a vice-president of Bell & Zoller Coal & Mining Co.

**J. F. Frost**, milling engineer for the Buchans Mining Co., Newfoundland, Canada, has joined the western department of American Smelting & Refining Co. as mining engineer. He succeeds **J. G. Piercy**, who has been assigned to a similar post with AS&R in New York.

**Charles L. O'Brien** was recently promoted to superintendent of the Indianola mine, Republic Steel Corp., Indianola, Pa.

**J. P. Caulfield** has been appointed assistant general manager, Western Mining Divisions, and **L. F. Pett**, general manager of Utah Copper Division, it is announced by Louis Buchman, vice-president of Kennecott Copper Corp.

Caulfield was associated with H. P. Whitney Enterprises until he joined the Kennecott organization, in February 1951, as general manager of Utah Copper Division.

Pett, the new general manager of Utah Copper Division succeeding Caulfield, became affiliated with Utah Copper in 1922 as clerk in the mine engi-



neering office in Bingham Canyon. He rose through the ranks to mine superintendent in 1949 and general superintendent of mines in 1950. In January of this year he was named general superintendent of operations for Utah Copper Division with headquarters in Salt Lake City.

The appointment of **Charles H. Marks** to the engineering staff of Bituminous Coal Research, Inc., has been announced by Dr. A. A. Potter, president of the coal industry's research agency.

He will be attached to the Columbus office of BCR under the direction of E. R. Kaiser, assistant director of research.

**H. J. Tillia**, western mines manager of Westvaco Chemical Div., Food Machinery and Chemical Corp., has recently resigned to take a position as exploration geologist for Eastern Mining & Metals Co. Tillia will have his headquarters in Singapore and will be working throughout southeast Asia.

**George H. Love**, president of Pittsburgh Consolidation Coal Co., has been elected a director of Union Carbide & Carbon Corp.

The board of directors of International Minerals and Chemical Corp. has elected **George W. Moyers** vice-president in charge of the Phosphate Division to fill the vacancy recently occasioned by the resignation of **Franklin Farley**. Moyers has been with International Minerals for 25 years. He is a graduate of the United States Naval Academy in engineering, and

started with International as an engineer at the corporation's mines in Florida. He was later made chief engineer and then transferred to New York as assistant to the vice-president in charge of the Phosphate Division. Subsequently he was made sales manager, the position he held until his recent promotion.

**Cornelius F. Kelley**, chairman of the board of the Anaconda Copper Mining Co., announced the following changes in the executive personnel of the company and its subsidiaries, Chile Copper Co., Chile Exploration Co. and Andes Copper Mining Co.:

**Richard S. Newlin**, heretofore assistant vice-president in charge of mining operations, has been elected vice-president in charge of mining operations, succeeding **Clyde E. Weed** who was recently elected vice-president in charge of operations of the company and its subsidiaries.

**Thomas A. Campbell** who has been



R. S. Newlin



T. A. Campbell



Burr Wheeler



R. Michaels

vice-president and managing director of the Chilean subsidiaries, has been elected to the position of executive vice-president of the Chilean subsidiaries to succeed **Burr Wheeler** who is retiring after 38 years of service.

**Rudolfo Michaels**, vice-president of Andes Copper Mining Co. and Chile Exploration Co., has been elected to the position of vice-president and resident director of those companies with headquarters at Santiago, Chile.

**Henry E. Gardiner**, of Santiago, has been named assistant vice-president of the two Anaconda subsidiaries.

**Edward G. Fox**, president of the Philadelphia and Reading Coal and Iron Co., announced the appointment of **Dr. Robert J. Day** to the newly-created post of Director of Research, effective November 1.

Dr. Day comes to the Philadelphia and Reading Coal and Iron Co. from the Pittsburgh Consolidation Coal Co. where, for the last three years, he was engaged in fuels research. Prior to that he was, for a number of years, a member of the staff of the Mineral Industries Experiment Station of the Pennsylvania State College in the Divisions of Petroleum and Natural

Gas Engineering and of Fuel Technology.

**W. Church Holmes**, formerly with Sunshine Mining Co., rejoined that organization on October 1 and will be in charge of new projects with headquarters at Spokane, Wash.

Holmes was graduated from the University of California in 1925. Employed by Bunker Hill and associated companies for several years, he joined Sunshine in 1935, and served as mill superintendent, chief metallurgist, and manager, Rare Metals Division until 1947. Holmes then spent three years with Nichols Engineering and Research Corp. and as a consultant specializing in metallurgical problems. In 1951 he became associated with Fluor Corp. as a project engineer and designed and supervised construction of a gas treating and sulphur recovery plant at Whiting, Ind.

**Dr. Edward R. Weidlein**, president, Mellon Institute, has announced the appointment of **Dr. Raymond H. Hartigan** as assistant director of research on the Institute's executive staff. In this capacity Dr. Hartigan will participate in the management of activities of the organization.

On November 30, **William Knowles**, manager of El Paso Phelps Dodge Refining Corp., will retire. This marks the end of 40 years in the copper industry, 23 of them with Phelps Dodge in El Paso.

**Henry V. Saunders** has retired as chief engineer of the American Coal Co. of Allegany County, and Mill Creek Coal and Coke Co. He was succeeded by **J. B. Farquharson**, formerly superintendent of the Deerfield mine of the American Coal Co. At the same time **James Elmer Brown, Jr.**, was selected to fill the vacancy created by the promotion of Farquharson.

**Oscar M. Wicken** recently joined Foote Mineral Co. as manager of the Sunbright, Va., division. The new division covers production of lithium chemicals and the quarrying of limestone. From 1941 until joining Foote, Wicken was with Northwest Magnesite Co. in various engineering and supervisory capacities.

**Leonard Townsend** resigned as solicitor for the board of governors of the Federal Reserve System to become an official of the Pan-American Sulphur Co. His association with Pan-American Sulphur became effective September 11.

**U. S. Smelting Refining & Mining Co.** recently promoted **Max M. DuBois**, general superintendent of the U. S. and Lark Mine, to assistant to the manager of western mines, succeeding **J. M. Ehrhorn**, who is assigned to special work in the company's western

operations. **Benton Boyd**, superintendent of the Lark Section, succeeds DuBois as general superintendent of the U. S. and Lark Mine. **Harold Wells**, assistant superintendent of the Lark Section, was promoted to superintendent, and **Clyde Gillam**, engineer, succeeded Wells.

**Charles R. Cox**, president of Kennecott Copper Corp., has announced the appointment of **Frank R. Milliken** as vice-president of the company. He will assume supervision of the company's mining operations in this country and in Chile.

**Benjamin N. Webber**, senior geologist with the U. S. Geological Survey, has been assigned to the Technical Cooperation Administration, U. S. De-

partment of State, for duty in Iraq. He is to serve as consultant in mineral exploration and development. For a number of years, Webber was connected with private mining enterprises in Arizona and other western states. For the past two years he has been attached to the British Guiana Geological Survey.

**R. E. Nelson**, former assistant to the president of American Gilsonite Co., has been appointed production manager, it has been announced by **Ernest F. Goodner**, president.

The appointment of Nelson coincides with the announcement that the company will soon handle its own sales, with **A. P. Dowler**, former vice-president, Cork Insulation Co., New York City, as sales manager.

## — Obituaries —

**S. E. Mahan**, 82, and a member of a pioneer family which had much to do with the development of the southeastern Kentucky coal industry, died recently in Williamsburg, Ky. Mining operations in which Mr. Mahan had an interest before his retirement include Mount Morgan Coal Co. and Mahan-Ellison Coal Co.

**Gilbert Earl Gildroy**, 58, president of Montana Coal Operators Association, died on September 15. He had suffered a heart attack a month before.

**Irvin E. Rockwell**, 89, died in Hailey, Idaho, on September 22. "Rock," as his friends called him, was born on a farm near Sun Prairie, Wis., in 1862. He was a cub-member of the group that started the *Minneapolis Journal* in 1880. In 1886 he abandoned journalism for a business career and by 1890 was head of a world-wide office supply and furniture business.

In the late 1890's ill health forced him to sell out the furniture business and he took up geology and engineering, which had interested him from student days.

These pursuits took him to Idaho. During the 52 years which followed, Mr. Rockwell's unbounded physical and mental energy made him a leader in every venture he undertook. He was known as a mining executive, farmer, banker, public utility builder and operator, business man, politician, author and philanthropist; and was the first Life Member of the American Mining Congress.

It was said of him that he never side-stepped a fight and never lost one. "Rock's" friends were numbered

by thousands and his passing will be regretted by every one.

**McHenry Mosier**, a mining engineer with the Bureau of Mines, U. S. Department of the Interior, since September 1935, died on October 19. At the time of his death he was executive officer of the Region VIII Bureau of

Mines - Geological Survey field team, passing upon mineral exploration projects for the Defense Minerals Exploration Administration.

Except for short assignments at Duluth, Minn., and Pittsburgh, Pa., when he first joined the Bureau, Mr. Mosier was headquartered at College Park, Md., and Washington, D. C., throughout his service. Working out of College Park, he supervised a group doing scientific research to advance mining practice. When the Bureau was regionalized after the war, he was made chief of the Mining Development Branch of the Region VIII Minerals Technology Division.

On September 24, **Daniel M. Kelly**, 72, administrative consultant and retired vice-president in charge of western operations of the Anaconda Copper Mining Co., died in Butte. Mr. Kelly was formerly Attorney General of Montana, acting in that position from 1912 until 1915, when he resigned to join the legal staff of the Anaconda Copper Mining Co. He was made western general counsel for the company in 1931 and became vice-president in charge of western operations in 1936, holding that position until he retired of his own volition in 1946.



# NEWS

## and VIEWS



## Eastern States



### Iron Mine Flooded

The Songo mine of the Woodward Iron Co. at Red Mountain, near Birmingham, Ala., has been flooded out. Operations, where possible, are being conducted through the Pyne Mine shaft.

### List Permissible Explosives

A list of explosives which have been declared permissible for use in coal mines under the safety standards of the Bureau of Mines, United States Department of the Interior, and a list of permissible blasting devices approved by the Bureau prior to December 31, 1951, have been made public.

The present list of permissible explosives supersedes all previous lists. Explosives transferred to the inactive list and those which have been admitted to the active list since December 31, 1945, are shown. Class designation according to the volume of poisonous gases, the weight of  $1\frac{1}{4}$  x 8-

in. cartridges, the velocity of detonation, and the manufacture of each brand are included.

In the list of approved blasting devices, the permissible conditions for charging each shell and the maximum weight of the heater element are given. The list of blasting devices is identical with that released on December 31, 1945.

A free copy of Information Circular 7640, "Active List of Permissible Explosives and Blasting Devices Approved Previous to December 31, 1951," may be obtained from the Bureau of Mines, Publications Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pa.

### 16 Months—No Accidents

The Florida Phosphate Division of International Minerals & Chemicals Corp., recently received a safety award from Liberty Mutual Insurance Co. for having completed 2,093,383 man hours of work during the period from February 23, 1951 to June 19, 1952, without a lost-time accident.

R. B. Fuller, manager of International's Florida Phosphate Division, received the award from Earle N. Lashmet, midwest divisional vice-president of Liberty Mutual Insurance Co., at a dinner meeting held at the International Park pavilion near Mulberry, Fla.

Similar awards have been made to the Division by Joseph A. Holmes Safety Association and the National Safety Council.

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### This Film Not Banned in Boston

The Film Council of Greater Boston, a select jury of leading ecclesiastical and lay citizens working for higher standards in motion pictures, has awarded to the Bituminous Coal Institute the certificate of first place in the public relations section of the Annual Film Festival. The "Oscar" was presented by Rev. Timothy F. O'Leary, assistant superintendent of diocesan schools, to R. P. Tibolt, of Boston, vice-president of Eastern Gas & Fuel Associates, representing the Institute, in recognition of the high quality of the color film, "Powering America's Progress," a story of bituminous coal.

Father O'Leary is president of the Film Council and Alan F. Lydiard, department of public services of the John Hancock Mutual Life Insurance Company, is treasurer. Serving on the board of directors are many persons prominent in educational and civic circles in Greater Boston.

The prize-winning film dramatically presents the story of coal in sound pictures made under actual working conditions. It was produced by the March of Time.

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## Aid to Austria's Iron Industry

During World War II, Russian forces removed most of the mining equipment from Austria's largest iron mine. Under Marshall Plan financing, the Erzberg and Radmer iron mines in southeastern Austria were rehabilitated. Now the Mutual Security



Agency has approved a \$500,000 supplemental program for financing equipment for further development of the iron ore deposits.

Erzberg development is one of the principal iron ore deposits in Europe with an estimated reserve of 350,000,000 to 500,000,000 tons.

## Coal in North Carolina

Local coking coals for non-metalurgical uses can be produced in a fuel-deficient region in central North Carolina if suitable commercial outlets are established, according to a U. S. Bureau of Mines study made public recently.

A report released by J. J. Forbes, Bureau director, estimates known reserves in the Deep River Coal Field—extending across parts of Chatham, Lee, and Moore Counties—at 87,548,000 tons of high-volatile bituminous, 50 percent of which is recoverable by present mining methods.

The survey is part of a project begun in 1941 under authority of the Department of the Interior to develop reserves of coking coal in areas where the fuel supply is critical.

The investigation of the coal deposit in the three North Carolina counties suggests that if a longface coal-mining system could be introduced, a high percentage of recovery would result—with minimum development. Because this region is the center of moderate industrialization, such as textile mills, cottonseed processing plants, and food processing firms, local coals would be valuable for heating and steam-raising. Washability tests on the coals by the Bureau showed some of them were good for coking, but that the

sulfur content was too high for metallurgical use.

Although coal mining in the area began a century ago, only one mine now is active, its output going to a nearby power plant.

Copies of the report, "Bulletin 515—Coal Deposits in the Deep River Field, Chatham, Lee, and Moore Counties, N. C.," can be obtained only from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 75 cents a copy. The publication is not for sale by the Bureau of Mines.

## Need Technical Men

A new examination for Chemist, Engineer, Mathematician, Metallurgist, Physicist, and Electronic Scientist has been announced by the Board of U. S. Civil Service Examiners for the Potomac River Naval Command, to fill positions paying from \$3,410 to \$10,800 a year in Naval field establishments in Washington, D. C., and vicinity and in the Engineer Center at Fort Belvoir, Va. Positions of electronic scientist in other Federal agencies in Maryland, North Carolina, Virginia, and West Virginia will also be filled from this examination.

No written test is required. To qualify, applicants must have had ap-



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propriate education or experience or a combination of both. In addition, for the higher-paying jobs, they must also show professional experience in the field of work for which they apply. Applications will be accepted from college students who expect to complete the required study within nine months. Age limits for positions paying \$3,410 are 18 to 35 years; for all other positions, 18 to 62. These age limits are waived for veterans.

Full information and application forms may be secured at most first- and second-class post offices, from Civil Service regional offices, or from the U. S. Civil Service Commission, Washington 25, D. C. Applications will be accepted until further notice and must be filed with the Board of U. S. Civil Service Examiners of the Potomac River Naval Command, Building 37, Naval Research Laboratory, Washington 25, D. C.



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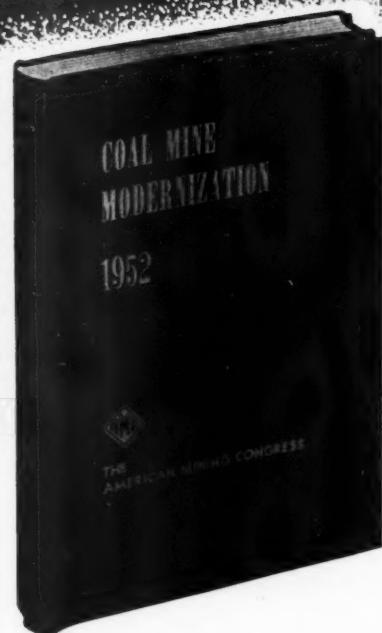
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## Describe Coking Coals

Four coal beds in Clearfield County, Pa., yield fuel that can be cleaned satisfactorily for making coke, according to findings of the U. S. Bureau of Mines, Department of the Interior.

In making their examinations in Clearfield County, Bureau engineers collected samples at 26 mines. Laboratory tests revealed that sulfur reduction is the principal washing problem in preparing marginal Clearfield County coals for coking.

The four better coking coal beds, together with their principal characteristics, are described by the Bureau as follows:

**Upper Freeport Bed**—A thin, persistent, low-sulfur deposit which must be considered a potential source of metallurgical coal.

**Lower Freeport Bed**—In the northern part of the county, this coal can be washed without difficulty to yield a low-sulfur float coal. As the deposit extends to the northern part of the county, sulfur and volatile content increase and the preparation of a metallurgical fuel from coal in this general area would require fine crushing and the separate disposal of a middling product.

**Lower Kittanning Bed**—In southern Clearfield County, this coal can be up-

graded to metallurgical standards over a wide area. Where the coal is overlain by a bench of bony coal, sulfur content is high. Sulfur and volatile content increase as the bed extends to the north, and samples collected near the Elk County line contain too much sulfur to be considered potential sources of coking coal.

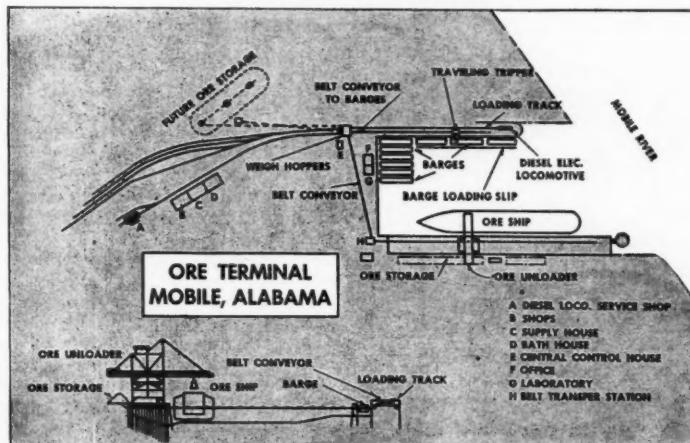
Tests also indicate that the Middle Kittanning and Brookville Beds in the county will not yield a clean coal satisfactory for coking because of excessive sulfur.

## South African Uranium

The first of six plants being erected in South Africa for the extraction of uranium oxide from Rand gold tailings, will begin operation in October, it has been reported from Johannesburg by the Johannesburg Star. This revelation follows a statement by South African Minister of Mines J. H. Viljoen, that South Africa is destined to become the world's biggest producer of uranium.

The plant is located at the West Rand Consolidated Mines, near Krugersdorp, 20 miles west of Johannesburg. Construction of the plant was financed by the United States and Great Britain, to whom South Africa has agreed to sell the uranium product.

## TCI Has New Dock Facilities



Tennessee Coal & Iron Division of United States Steel Co. will handle imported ore at its new iron ore terminal in Mobile, Ala., with a 15-ton capacity unloader being constructed by Dravo Corp., Pittsburgh.

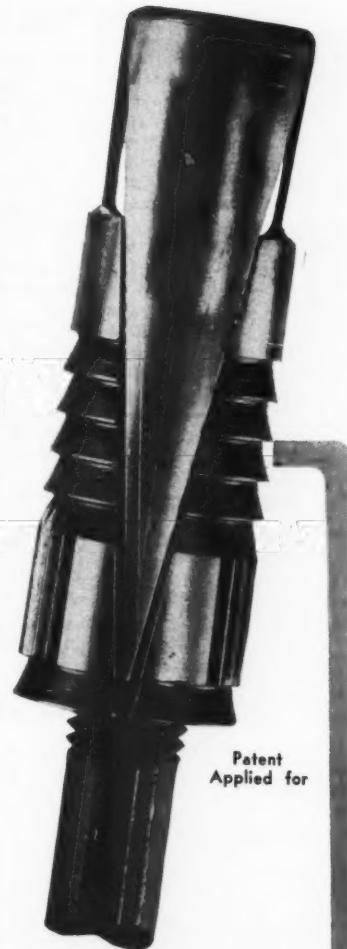
The unloader, operating on four, eight-wheel trucks along the dock of a slip in the Mobile River, will deposit ore from the ships into hoppers feeding a 42-in. wide conveyor belt. The conveyor system is so arranged that ore may be loaded into railroad cars, barges or delivered to storage.

Design of the unloader permits the addition of a second conveyor belt.

The unloader will feed to either or both belts. Additional unloaders may be added to expand the terminal's utility and capacity.

The ore bucket and operator's cab are suspended from a trolley that runs on the structural steel runway extending 109 ft over the water from the tower. The runway also projects 51 ft from the rear of the tower so that the area below can be used for temporary ore storage.

The boom over the water is hinged where it joins the tower so it can be raised almost vertically to clear superstructures of ships.



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## Education Committee Meets

On October 9, 10 and 11 the Education Committee, National Coal Association, met at the Pennsylvania State College campus in State College, Pa. A special meeting was held on October 9 which dealt with the problem of training courses for coal salesmen. A suggestion was made that a plan be prepared for a course to be given during the last two weeks of June, 1953, at Pennsylvania State College. This would follow the commencement activities and would precede the summer school beginning in July. The regular meeting of the committee was held on Friday and Saturday. Facilities of the School of Mineral Industries were inspected and members of the school reported on their several branches of instruction and research.

## Revise Purchase Program

The government purchase program for columbium-tantalum bearing ores and concentrates at premium prices has been extended to include small lot shipments from the smaller domestic producers, Jess Larson, Administrator of the Defense Materials Procurement Agency, has announced.

The purchase program, first an-

nounced last May, offered an incentive bonus which about doubled the current market price for these scarce ores and concentrates. It provided for the sale to the government, in shipments not less than 2000 lb, of specified grades of materials at designated shipping points.

The amended regulation provides for the acceptance of shipments less than 2000 lb at government purchase depots located at Spruce Pine, N. C., Franklin, N. H., and Custer, S. D. Such small lots must contain a minimum of 50 percent columbium and tantalum pentoxide, in any ratio, and be of domestic origin. Shipment should be made f.o.b. to any of the three depots.

Payment will be made at the flat rate of \$1.70 per lb of acceptable grade material, which includes the 100 percent bonus. This is the equivalent of \$3.40 for each pound of combined contained pentoxide in 50 percent ore.

## Nicarao in Full Operation

Nicarao, giant U. S. government-owned and privately-operated Cuban nickel plant, is now in full operation, providing the strategic metal.

In announcing the resumption of full

operation at Nicarao, Jess Larson, Administrator of General Services, stated that recent production figures indicate that the plant has met the goal of higher efficiency by producing nickel in greater quantities than in its first tour of duty in World War II.

One of the world's largest nickel producers, the plant is located in Oriente Province, Cuba, about 450 miles east of Havana in the sugar cane country. It was begun in 1942 and produced 63,500,000 lb of nickel prior to its shutdown as a surplus operation in 1947. The original cost of the plant, which, with its facilities, occupies 1133 acres, was \$32,500,000.

The speed-up restoration at a cost of approximately \$12,000,000, began early in 1951 at the direction of the Munitions Board. The urgent work has been completed on schedule, carrying out a specific recommendation of the Preparedness Subcommittee, Senate Committee on Armed Services, which urged swift rehabilitation of the Cuban nickel facilities.

## Sixty-sixth CMI Meeting

The 66th annual meeting of the Coal Mining Institute of America is to be held at the William Penn Hotel in Pittsburgh, Pa., on December 11 and 12. Guest speaker at the annual dinner on Thursday night, December 11, will be Tom Pickett, executive vice-president, National Coal Association.

## Improve Ore Route

The Gulf, Mobile & Ohio R. R. is to renovate the bridge over the Warrior River, near Tuscaloosa, Ala., preparatory to moving Venezuelan ore from Mobile to Birmingham. The GM&O has leased the L&N tracks from Tuscaloosa to Birmingham, and plans to run two ore trains per day.

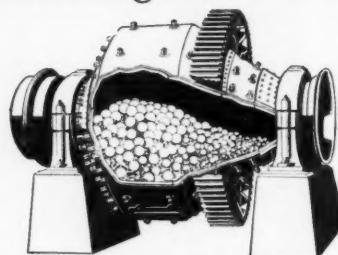
## Battelle Goes Abroad

The cornerstone for a new research center at Frankfurt/Main, in Germany, to serve the industry of that country, was placed October 31. The new Battelle Memorial Institute for Germany is being established by Battelle Memorial Institute, American research foundation at Columbus, Ohio.

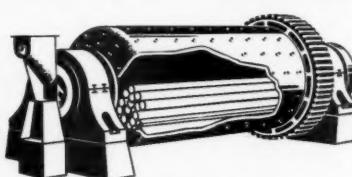
Simultaneously Battelle director Clyde Williams announced that Battelle is establishing another research center at Geneva, Switzerland, and has set up a program of fellowships for selected students in the universities of both Switzerland and Germany. In addition, research centers and fellowship programs for other countries of Western Europe are contemplated.

The Frankfurt research center will engage in chemical, metallurgical, and engineering research. It is already under construction on a site presented for the purpose by the City of Frankfurt.

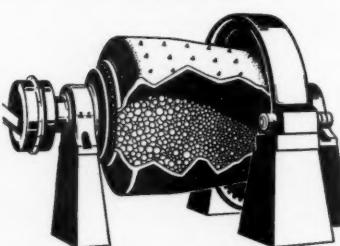
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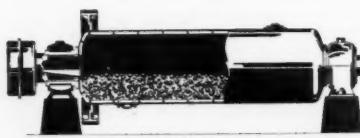
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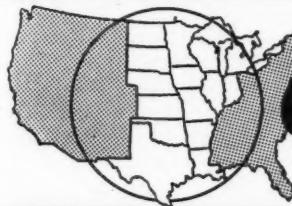
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# Central States

## Eagle-Picher Builds

The Eagle-Picher Co. is preparing to build a large zinc roasting and sulphuric acid plant at Galena, Kans. The Missouri Farmers Association will erect a companion plant on the Missouri side of the state line, five miles west of Joplin, Mo., for the production of fertilizer. The major portion of the sulphuric acid production projected by Eagle-Picher has been contracted for by M.F.A. It will be piped directly from the acid plant, across the state line north of U. S. Highway 66.

## Jamaica Ore Arrives

On October 29 the first cargo of foreign-mined ore transported in its own vessel from Jamaica to Mobile, Ala., arrived at the Hurricane Creek alumina plant of the Reynolds Metals Co. in Saline County, Ark. The imported bauxite is being blended with domestic production to provide feed for the Hurricane Creek plant.

## Let Manganese Contract

R. L. Wilson, R. L. Wilson Associates, Detroit, Mich., has announced the signing of a contract with the U. S. Manganese Corp. for 20,000 tons of manganese ore for use in steel production for defense. The Atlas Mining Co., Aguila, Ariz., one of Wilson's five mining holdings, is making shipments on the contract from Black Nugget No. 1 Mine, Maricopa County, Ariz., in accordance with government specifications P 30.

## Now Calumet & Hecla, Inc.

Stockholders of Calumet & Hecla Consolidated Copper Co. recently approved a change in the company name to Calumet & Hecla, Inc.

They also approved a proposal which would permit moving the principal business office from Boston, Mass., if directors so elected. There is no present intention to move the office, it is reported.

## Finish Map Making in S. D.

The largest geological mapping project in the history of South Dakota has been finished after 3½ years of work by 27 geologists, reports Dr. E. R. Rothrock, South Dakota state geolo-

gist. The project includes 26 maps, covering the Missouri River Valley and environs from the North Dakota line to the Fort Randall Dam.

Each map covers an area of 20 sq miles, showing outcroppings of types of rock formations and mineral resources in valley bluffs and tributaries, including deposits of sand, gravel, cement rock, refractory and common clays, marls, oil shale and manganese.

The project, begun by Gov. Mickelson and completed by Gov. Anderson, is part of South Dakota's contribution to the Missouri Valley development program. Maps can be obtained from the State Geological Survey, University of South Dakota, Vermillion, S. D.

## Open Zinc Deposit

A zinc deposit has been opened two miles north of Duenweg, Mo., by a group of Tri-State district men, operating under the name of the S. & P. Mining Co. The deposit is on the old Colony mine tract and a few of the old drifts of the original Colony mine have been reopened. The Colony was worked with hand steel and some of the old hand steel has been found in the drifts.

The shaft of the new mine is down to the 175-ft level through a 15-ft face of ore. Exploratory operations were started a year ago on the 40-acre lease with drilling and pumping.

## Search For Uranium

Exploratory drilling in South Dakota has been planned by the Atomic Energy Commission in its search for additional deposits of uranium ore. Bids have been called for between 10,000 and 20,000 ft of diamond drilling in South Dakota's Edgemont District, where intensive activity by the government and private industry is developing a new uranium producing district.

## Hold 60th Annual Meeting



From left to right: William M. Bolt, new president of the Illinois Mining Institute; B. E. Schonthal, secretary-treasurer; Milo K. Swanton, executive secretary, Wisconsin Council of Agriculture Cooperative, who was guest speaker at the banquet; and Clayton G. Ball, outgoing president.

ON Friday, October 24, 740 coal mining men from all over the nation gathered at Springfield, Ill., for the Sixtieth Annual Meeting of the Illinois Mining Institute.

William M. Bolt was elected as the new president of the group at the business session on Friday morning. Then the morning technical session was opened by President Clayton G. Ball and two papers were given: one on the use of untreated vs treated cotton-nylon conveyor belts and the other on mechanized mining trends in the coal industry. The rest of the morning was devoted to two films taken during the 1927 and 1928 trips

of the Institute on the Mississippi River.

During the afternoon three papers were presented: one on coal preparation at Orient No. 3 mine, another on the use of man-trip cars in Hanna Coal Co. mines, and the third on auger mining in Illinois coal.

In the evening a banquet was held which 460 people attended. President Ball introduced officers, the executive board and distinguished guests. Milo K. Swanton, Executive Secretary, Wisconsin Council of Agriculture Cooperative, gave a talk entitled, "Blind Gamblers are Gone Geese."

## Talc Mill at Grand Island

Sierra Talc & Clay Co., of California, has opened a new \$500,000 mill at Grand Island, Nebr. to process raw talc from the company's mines in Nevada, California and Montana. Grand Island was selected as a mill-site because of its strategic rail location. Sierra's expansion program, according to Henry Mulryan, executive vice-president, has been greatly accelerated by the growing industrial demand during the last few years for California quality talc and by the discovery of a large deposit near Norris, Mont.

## Consolidated Feldspar Sold

Consolidated Feldspar Corp. has agreed to sell substantially all of its assets to International Minerals & Chemical Corp. in exchange for 108,534 shares of International's common stock, according to a joint announcement by Louis Ware, International's president, and A. J. Fink, chairman of the board of Consolidated. The acquisition is scheduled to take place on November 28, 1952.

The proposed transactions are subject to the approval of the stockholders of Consolidated Feldspar Corp.

Consolidated Feldspar Corp., with main offices in Trenton, N. J., is pri-

marily a producer of feldspar and also produces aplite, mica, lepidolite, flint and beryl. Its operations consist of open pit and underground mining of ore followed by storing, crushing, beneficiating, and pulverizing of the product. At the present time it is mining in Arizona, Colorado and South Dakota. It has active mills in Arizona, Maine, New York and South Dakota.

## Begin Refining Aluminum

Lawrence Litchfield, Jr., president of the Alcoa Mining Co., recently inaugurated continuous operation at the Aluminum Ore Co.'s bauxite refining plant near Bauxite, Ark., by dumping the first load of ore into the plant. On October 14, 1952, Litchfield pulled the lever which dumped 22 tons of bauxite into the receiving pit of the new refining plant, much of which is still under construction.

Construction on the plant started in April 1951, and is scheduled to be completed next spring. Its construction cost is estimated at \$54,000,000.

The ceremony marked the finishing of the connecting link between Alcoa's bauxite mines in Arkansas and its smelters in Texas. Now, bauxite produced by the Alcoa Mining Co. will be refined to alumina in its own plant

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3—200 KW G.E. Syn. 275 V 1200 RPM

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1—250 KW West. Syn. 275 V 1200 RPM  
2—200 KW G.E. Syn. 275 V 1200 RPM

1—100 KW G.E. Syn. 275 V 1200 RPM

These are complete with switchboards, switchgear, and single phase transformers for 2300 volt.

1—250 KW West. Mine Type Rectifier

### LOCOMOTIVES, 250 V DC, BALLBEARING

2—20-ton Jeffrey, MH-77

2—15-ton West. 910-C4

2—15-ton West. 908-C

2—15-ton West. 908-C

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2—13-ton G.E. HM-829

4—13-ton G.E. HM-827

2—13-ton Jeffrey MH-110

4—10-ton Goodman 34-B

3—8-ton G.E. HM-819 with reels

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6—14-BU-TRBE Joy 2—360 Goodman

6—14-BU Joy 4—260 Goodman

6—8-BU Joy 5—L-610 Jeffrey

10—7-BU Joy 2—L-500 Jeffrey

2—Myers-Whaley No. 3 Automats, practically new.

### AC CUTTING MACHINES—220/440 V

2—Jeffrey 29-U 5—Goodman 12G3

1—Jeffrey 24-U 5—Goodman 112G3

3—Jeffrey 35-BB 4—Goodman 112G3A

1—Jeffrey 35-L 2—Goodman 112DG3A

### PERMISSIBLE TYPE, 250 V DC

6—Jeffrey 29-U on rubber tires

3—Jeffrey 29-U cat mounted

4—Jeffrey 29-U track mounted

5—Jeffrey 29-UC

10—Jeffrey 25-BB

4—Jeffrey 35-BC

8—Sullivan 7-B on cats

6—Goodman 512 on cats

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and ship it to Texas for smelting into aluminum metal.

## South Dakota Uranium Deposit

Discovery of the "most sensational" deposit of uranium bearing ore yet found in the Black Hills of South Dakota has been reported in the Deadwood papers. The ore contains uranium oxide, which will be recovered as a by-product in mining of beryl, feldspar, mica, columbite and tantalum. The ore was discovered last spring by John Ross in the Highland lode mine, four miles west of Custer, S. D. Ross has been reported to have obtained a Reconstruction Finance Corporation loan to expand operations at the mine from which he has been taking beryl, feldspar and mica.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of THE MINING CONGRESS JOURNAL, published monthly at Washington, D. C., for October 1, 1952.

City of Washington,  
District of Columbia, as:

Before me, as notary public in and for the state and county aforesaid, personally appeared John C. Fox, who, having been duly sworn according to law, deposes and says that he is the Editor of THE MINING CONGRESS JOURNAL, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in Section 537, Postal Laws and Regulations, printed on the reverse side of this form, to wit:

1. That the names and addresses of the publisher, editor and business manager are:

Name of publisher, The American Mining Congress, Washington, D. C.

Editor, John Cameron Fox, Washington, D. C.

Business manager, B. C. Wilkerson, Washington, D. C.

2. That the owners are: The American Mining Congress—a corporation, not for profit. No stockholders. President, Howard I. Young, St. Louis, Mo.; Executive Vice-President and Secretary, Julian D. Conover, Washington, D. C.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: None.

JOHN C. FOX,  
Editor.

Sworn to and subscribed before me this 2nd day of October, 1952.

NOLIA B. HOWARD,  
Notary Public.

(My commission expires Sept. 30, 1957.)

## BOOK REVIEWS

THE MINING JOURNAL ANNUAL REVIEW 1952 EDITION, *The Mining Journal, Ltd. 15 George St., London, E.C. 4.*

ONE of the leading mining publications in England reviews the world mining industry. Mining and metallurgical developments during 1951, the world over are outlined and correspondents in the major mining nations review mineral prices and developments in their particular area.

The volume is valuable in that it pictures conditions from a different position than we are used to. It is good to get an outsider's slant on things now and then.

CONCILIATION IN ACTION, by Edward Peters, Conciliator of the California State Conciliation Service. Published by the National Foremen's Institute, Inc., New London, Conn. Cloth bound—270 pages. Price \$4.50.

"CONCILIATION in Action" is a comprehensive, readable statement of the principles of conciliation written by Edward Peters, drawing upon his

wide experience with the California State Conciliation Service. It is intended as a working manual for the labor relations field and more specifically for those involved in the conciliation process. Peters states in his introduction that it is his desire to clarify a subject of which there has been a lot of "hocus-pocus" written and of which there is very little understanding.

Divided into two parts, the first section of "Conciliation in Action" sets the essential groundwork for discussion of successful conciliation by summing up the events that lead up to a deadlock in collective bargaining.

The second and longer section proceeds from the entrance of the conciliator into the dispute and traces the factors that will influence his role as the third party. Here the type of role the conciliator should play is outlined; the difficulty in finding the real issues of the dispute and the weight of all these factors in bringing the conciliation to a successful conclusion.

His final chapter is a statement of the personal qualities and ethics of the successful conciliator. Throughout the book, points are illustrated with case histories.

The author ends his book with a list

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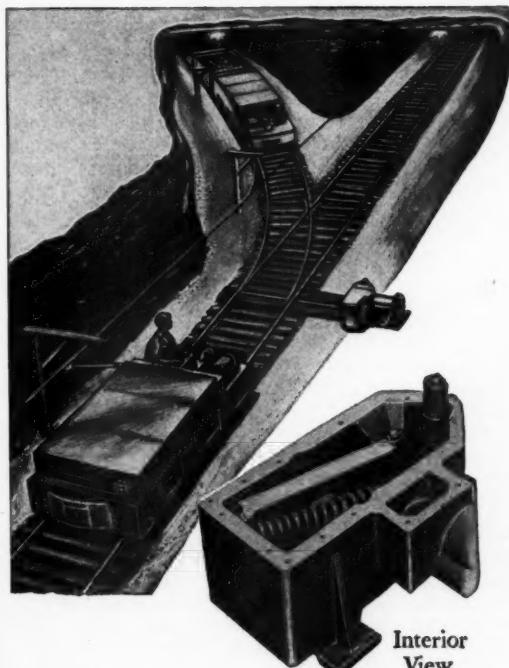
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of the qualities that are necessary for the successful conciliator; experience, objectivity and impartiality. The most difficult to attain is the latter. The key to impartiality is the realization that the conciliator's sole function is to achieve a settlement.

Glenn A. Bowers, Supervisor of the California State Conciliation Service, describes "Conciliation in Action" in the foreword as "... an opportunity for leaders in the second and third echelons of the employer and union organization to look inside the conciliation process and see how it works."

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# Western States

## Bagdad Copper Expands

The government has guaranteed Bagdad Copper Corp. at Bagdad, Ariz., a market for up to 27,000,000 lb of copper per year at 24½ cents a lb f.o.b. middle western markets, and 940,000 lb of molybdenite at 60 cents a lb for molybdenite contained in concentrates. With this guarantee, Bagdad will undergo major improvements in expansion during the next two years to increase production. Expansion will include enlargement of the open pit itself and the installation of new electrolytic refining facilities. At present the company produces only concentrates which are shipped to El Paso, Tex., for smelting and refining. The company's present annual capacity is 20,000,000 lb of recoverable copper contained in concentrates.

## New Idria Gets DMEA Loan

Defense Minerals Exploration Administration has approved application by the New Idria Mining and Chemical Co. for an exploration assistance loan to be applied to exploration for new quicksilver ore bodies at the New Idria mine in San Benito County, Calif. Geologically favorable, virgin areas will be explored in the mine. New Idria was the largest domestic producer of quicksilver in World Wars I and II.

## New Mining Code for Idaho

Idaho's new mine safety code has been put into effect. It replaces old standards, most of which were adopted in 1909, and brings the state's safety standards and regulations up to date. The Industrial Accident Board and the mine inspector's office approved the new code upon recommendation of a three-member committee representing unions and the mining industry.

## Activity at Meadowview

Two partners, Elmer Enderlin and Henry Connolly, have reported reaching the first objective in a Defense Minerals Exploration Project on their Meadowview claims, near Fourth of July Lake in Custer County, Mont. An exploration crosscut has intersected the first vein in the claims disclosing zinc and tungsten ore. It is estimated that 80 ft remain to be

driven to intersect the second vein. This is expected to be accomplished in the near future. When both veins have been opened, drifts will be started to explore the structures further. The claims were located in August, 1950, and last year two miles of access road to the property were bulldozed, a portable compressor installed and about 50 ft of crosscutting completed.

## That's a Lot of Phosphate

The 100,000th carload of potash was recently shipped from International Mineral & Chemical Corp.'s mines at Carlsbad, N. M. The carload of potash was consigned to N. S. Koos and Son Co., fertilizer manufacturers in Kenosha, Wis.

International Minerals is one of the largest miners and refiners of potash ore in the United States, producing approximately one-fourth of the total domestic output of potash salts. The first commercial mining of potash in New Mexico began in 1931.

## Convert Admiral Mill

Admiral Consolidated Mining Co. has overhauled its mill and converted it for lead and zinc separation. A diamond drilling program is being carried out at the Admiral mine, located north of Leadpoint, Wash. The company will custom mill ore from the Red Top Lucille mine, operated by the Pacific Northwest Mining Co. until production is resumed at the Admiral mine.

## Research on Titanium

The new development section of the titanium research program of the U. S. Bureau of Mines at Boulder City, Nev., is now in the operational stage. According to Rex Lloyd, bureau official, the plant is dedicated to finding means of reducing the cost of metallic titanium below the present \$5 a pound level.

The plant is administered by the electrometallurgical branch of the metallurgical division of Region III of USBM. Experiments performed in the research section that look promising will be continued on a larger scale in the new development section at Boulder City.

## Lead, Gold, Zinc Find

James P. Webb and Melvin Galmon have discovered a vein of ore in Illinois Gulch on the Pittsburgh Placer near Breckenridge, Colo. Ore contains substantial amounts of lead, zinc, silver, and gold. Present plans of Webb and Galmon call for development of the vein by stripping with a dragline.

## Vitro Chemical Active

The Vitro Chemical Co. is completing a large expansion program at its plant in Salt Lake City, Utah, which processes uranium bearing ores from Utah and Colorado.

Included in the expansion program was the construction of four large thickener tanks, 70 ft in diameter, and a filter house. End product of the mill is uranium oxide.

Vitro is still buying most of its ore from the Marysvale, Utah, uranium mining district, but new areas of non-vanadium type uranium ores are now being developed from which Vitro expects to obtain ore shipments. The Marysvale ore is bought direct from the AEC stockpile there, and is shipped via rail to Salt Lake City.

The mill employs an acid-leach method to treat the ores and obtain uranium oxide. This poses a tremendous tailings-disposal problem. At present two tailings ponds are in operation and a third is projected on a 75-acre area adjacent to the mill.

## Chrome Plant Under Construction

A large chrome refining plant is being installed six miles north of San Luis Obispo, Calif., by the United States Chrome Corp. The plant is to be located near the entrance to Tassajara Canyon on the George Miller and Charles Seely property. The mine is an open pit.

## Establish Scholarship

Edward W. Hinderberger, Jr., a graduate of the Globe, Ariz., high school, is the initial recipient of a new \$4000 scholarship award established by Inspiration Consolidated Copper Co. The scholarship is limited to graduates of Globe and Miami high schools, with preference given to candidates who are sons or daughters of employees of Inspiration.

According to P. D. I. Honeyman, vice-president and general manager, the scholarship will be an annual award. The \$4000 will be made available in annual payments of \$1000 each, to an incoming freshman in the college of engineering or in the college of mines, University of Arizona. The \$1000 stipend is renewable during each of the next three years of the student's academic career, upon maintenance of a satisfactory scholastic standing.

## New Smelter for Oregon

Thirteen and one-half acres of city-owned land at Springfield, Ore., have been purchased by the Apex Smelting Co. of Chicago for a new silicon aluminum plant. Construction of the new plant is expected to start this winter. Aluminum silicate clay from the Cottage Grove, Ore., area will be treated to produce aluminum.

## U. S. Steel in Montana

U. S. Steel Co. has taken a lease on eleven southeastern Ravalli County, Mont., mining claims containing fluor-spar, according to recent reports. The ore, said to be high grade, will be loaded in Darby.

## Majuba Plant Operating

The gravity concentration-flotation plant at the Majuba copper-tin mine southeast of Imlay, Nev., is reported to be in operation. Tin is separated from the other minerals by gravity separation and copper, gold and silver recovered by flotation.

First Uranium Corp. of Nevada, which operates the plant and mine, reported recently the mill was treating 200 tons of ore daily. The company hopes to develop the project into the foremost American tin producer. Mine workings include 3000 ft of drifts and crosscuts and about 500 ft of shrinkage raises.

Situated in the Trinity range, the Majuba was an important copper and tin producer during World War II. Previous operators mined copper, gold and silver from relatively shallow workings.

## Sign Copper Contract

A floor-price purchase contract for copper and molybdenum has been signed with San Manuel Copper Corp., according to an announcement by Jess Larson, administrator, Defense Materials Procurement Agency. The action completes the government's negotiations, Larson said, for development of the huge San Manuel property near Tiger, Ariz.

The DMPA contract guarantees San Manuel a market for 365,000 short tons of electrolytically refined copper and 16,060 short tons of molybdenum contained in concentrates. The guaranteed price for copper is 24 cents a pound, one-half cent below present ceiling, and 60 cents a pound for the molybdenum concentrates.

As in other floor-price purchase contracts negotiated by DMPA, the government has an option to purchase the company's total output upon advance notification. It is expected, however, that most of the company's output will be sold to industry.

Previously, the Reconstruction Finance Corp. has approved a \$94,000-

000 development loan to San Manuel, with the condition that the company raise \$17,000,000 to supplement the \$10,000,000 already expended in exploration and engineering.

The government's contract calls for the mine to be in full operation within four and one-half years. Development of the mine will require, in addition to actual mine equipment, the installation of a mill and smelter, construction of a townsite, power plant, railroad connection, and various auxiliary facilities. First production is scheduled for 1955.

A site approximately eight miles from the mine has been selected for the town—tentatively named San Manuel. The location is a gently sloping area between the Santa Catalina Mountains and the San Pedro River, which will provide suitable terrain for the town, mill, smelter, and tailings dump. It is predicted that the town will probably have a population of 7000.

At present, a crew of 130 men working on a three-shift basis is completing the final phases of the initial development program. During the coming months the 4400-ft main haulage level will be driven through the ore body to connect the two shafts already sunk.

## Truck Phosphate Ore

Peter Kiewit Sons Co. recently began trucking phosphate rock from the Waterloo mine near Montpelier, Idaho, to the Waterloo mill, according to Rance Hinnewinkle, superintendent. Trucking will continue until 100,000 tons of commercial grade rock have been hauled to the Montpelier railhead.

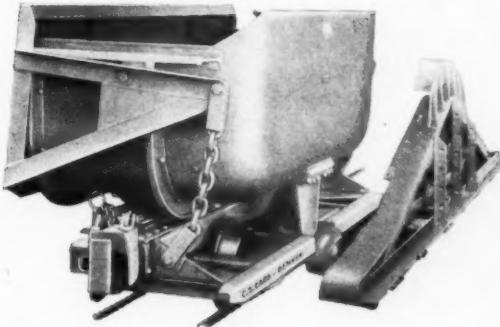
Approximately 50,000 tons of ore are ready for hauling and stripping is well along. The 20-ton trucks will operate on a ten-hr day schedule.

## Dredge California Gold

Successful operation of a dragline dredge at French Corral, 14 miles west of Nevada City, Calif., by Minona Mining Co. is expected to revitalize placer mining on the North San Juan gravel channel between Birchville and North San Juan, a distance of six miles. Minona Mining is dredging 2000 cu yd of gravel daily. The channel is free of overburden between these two points, because most surface material was washed off by early hydraulic operations. The dredge has been operating about a year and the management intends to increase its capacity to 4000 cu yd a day in the near future.

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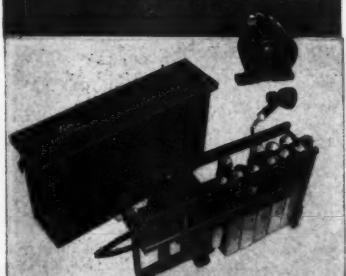
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## **Gold Claims Optioned**

Seven gold claims near Kendall, 20 miles north of Lewistown, Mont., have been optioned by the Caledonia Silver-Lead Mining Co. of Kellogg, Idaho. The properties formerly were operated by the Barnes-King Development Co. and later by the North Moccasin Mines Syndicate. The Caledonia Co. also owns and is developing a "dickite" clay deposit near Lewistown.

## **Mexican Sulphur Plant**

Pan American Sulphur Co. has announced plans to build a multi-million dollar sulphur plant in Mexico. The plant is to be located on concessions totaling 22,000 acres around the Jaltipan salt dome in southern Vera Cruz. It is expected to be capable of producing between 300,000 and 600,000 lb of sulphur annually.

## **Push Production**

A 16 percent expansion of ore production is planned by the Copper Canyon Mining Co. at its plant in Battle Mountain, Nev., by operating its selective flotation concentrator seven days a week. The plant has a capacity of 350 tons of ore a day and turns out a lead-zinc concentrate carrying some silver, copper and gold. Production has been increasing in recent months and the mill is now operating at a near capacity rate.

There are ample ore reserves and new ore is constantly being developed. Production is chiefly confined to the Hornfels lead-zinc orebody on the 600 and 700-ft levels of the Julie shaft. The Copper Canyon mine is located south of Battle Mountain, Nev., and was Nevada's fourth largest producer, during World War II, of copper and a major gold producer during the 'thirties.

## **Antelope Is Active**

Preliminary work has begun at the Antelope Copper mine, 35 miles from Hollister, Calif., preparatory to installation of units for precipitation of the copper from crushed ore. Developed by 500 ft of tunnels, the property is said to contain an orebody 50 ft wide.

Crushed ore will be leached and the copper precipitated with scrap iron in vats. Resulting precipitates will be collected, dried and shipped to a smelter for refining. The copper ore also contains gold values according to company management. A ball mill and concentrator will be installed to treat gold if future operations warrant it. Discovered about 1852, the Antelope has been worked intermittently by various operators. It is now owned by Arthur S. Pearce of San Juan Bautista, Calif., H. V. Underwood, and Ed Matthews of Hollister.

## Open Tungsten Deposit

Work has been started on a tungsten deposit discovered near Marysville, Mont., by W. R. Wade and H. G. Obendorf. The tungsten discovery is near the famous old Drumlummon mine, operating under the name of Montana Rainbow Mining Co. during the past several years, which has a past production record of \$23,000,000 in gold and silver.

## Gold Mine Buys Meat Firm

Central Eureka Co., a Sutter Creek, Calif., gold mining concern, has absorbed the Kaufman Meat Co. of San Jose, Calif.

According to Donald D. Smith, president of the mining company, the reason for the merger is to give the company more stability. Gold mines tend to suffer in periods of inflation, while meat companies usually enjoy their best results then. On the other hand, gold mining has certain depression resisting characteristics while meat companies are at a disadvantage in depressed times.

## Lakeview Scheelite Plant

Lakeview Tungsten Co. is operating its new concentration plant on scheelite from its Lakeview property in Humboldt Canyon, near Lovelock, Nev. Equipped with a jaw crusher, rolls, and five concentrating tables, the mill has a capacity of 50 tpd. The mine has been developed by a 300-ft tunnel, but conversion to open-pit mining is planned.

## Amend GSA Regulation

The Government will accept shipments of manganese ore at its purchase depots at Wenden, Ariz., and Deming, N. M., with a high lead and zinc content, provided such ore can be nodulized and up-graded to meet specifications, the General Service Administration announced September 23.

Government specifications call for ore with a maximum copper-lead-zinc content of 1.0 percent, of which not more than 0.25 may be copper. Under amended regulations, ores with a higher lead and zinc content will be accepted if such ores can be nodulized and up-graded to meet these specifications. The shipper will be charged \$2.25 per long ton for high lead and zinc ores to cover costs of nodulization, GSA said.

Purchasing of manganese is handled by the Emergency Procurement Service of GSA for the Defense Materials Procurement Agency. EPS also operates manganese depots at Butte and Philipsburg, Mont., as well as a nation-wide program under which producers may deliver specification ores in carload lots at any rail point.

## Dry Wyoming Coal

Plans for the construction of an experimental retort plant for drying and upgrading coal at its Elk Mine in Lincoln County, Wyo., have been announced by The Kemmerer Coal Co. The plant is being installed as part of an effort to promote more extensive use for western coals in the expanding industrial markets of the West.

## Dedicate New Plant

Top government defense agency officials joined with Aluminum Co. of America executives and Washington State dignitaries September 13 to dedicate the nation's newest aluminum producing unit built by Alcoa at Wenatchee, Wash.

The coming of the Alcoa project to Wenatchee has made possible the creation of over 150,000 kw of new firm power in the northwest at a critical time in the country's defense program.

The \$45,000,000 smelting works, said to represent the largest investment of private capital for manufacturing facilities made at one location at one time in the State of Washington, was formally dedicated by Alcoa's president, I. W. Wilson.

More than 2000 visitors to the plant

witnessed the dedication ceremony.

The new smelting works is located along the Columbia River, 13 miles south of Wenatchee, in the heart of Washington's famed fruit-growing country.

## Bullion-Monarch Contract

Bullion-Monarch Mining Co. has signed a contract with the Defense Minerals Exploration Administration for exploration of uranium ore in the Marysville, Utah, district. R. N. Cooper, secretary of the company, said that a 100-ft shaft, three crosscuts and raising was planned off the main tunnel on the Bullion claims at Marysville.

## Dragline Dredging Operation

Operating a 200-ton dragline dredge in a canyon 14 miles from Chico, Calif., C. H. Thurman and A. J. Wright are treating about 1000 cu yd of gold-bearing gravel daily. The dredge works to bedrock, at about 15 ft, and is powered by electricity. Gravel handled by the dredge is washed in a 300-ton plant equipped with gold recovery units. Site of the activity is the ancient bed of Big Creek in the Sierre Nevada mountains.



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## Garnet King Mine Develops

Garnet King Mines is pressing development work at its tungsten property in the Cucamonga district near Goldfield, Nev., preparatory to opening a concentrator to treat 100 tons of ore daily. Sufficient scheelite exists on the surface for present milling requirements and overburden has been stripped from a large ore body preparatory to open-pit mining. Underground development and mining will be undertaken later.

## Lease Fluorspar Lands

Eleven leases near Hamilton in southeastern Ravalli County, Mont., containing fluorspar, have been assigned to the U. S. Steel Co. by their owners, R. D. and Opal Flightner, Lester and Grace Thompson and A. O. and Louise Cumley. The ore will be shipped from Darby, Mont.

## Perlite Operations in New Mexico

Crushed perlite ore is being produced by the El Paso Perlite Co. from a plant at Gage, N. M. The plant is a pilot model with a daily capacity of 75 to 90 tons. Obsidian for the plant is being quarried from a surface deposit northwest of Gage.

## Ship Advance Concentrates

First concentrate shipments have been made from the 50-ton Advance flotation mill of Mines Managements, Inc., located near Northport in Stevens County, Wash. The first carload of lead was shipped to Consolidated Mining and Smelting Co.'s lead smelter at Trail, B. C.

Mill feed, mostly development ore, is coming from the Advance mine in Black Canyon, six miles out of Northport. At the company's Iroquois mine near Leadpoint, Wash., diamond drilling, partially financed by DMEA, has disclosed a large deposit of low-grade lead-zinc ore. A crosscut is now being driven to check one of the holes which penetrated a better-than-average mineral zone.

## Fluorspar Mill Operating

Operation of the new fluorspar flotation plant built a mile west of Fallon, Nev. by the Kaiser Aluminum & Chemical Corp., began in September. The plant has a capacity of 100 tons of ore a day, from which 30 to 50 tons of concentrates is produced. Concentrates will be shipped to Nichols, Calif., for additional treatment. Daily output of concentrates will depend upon grade of fluorspar mined at the Baxter property in the Broken Hills District. Foster is general superintendent of operations and Jay Shoemaker, mill superintendent.

Kaiser purchased the Baxter mine a few months ago from H. W. Gould

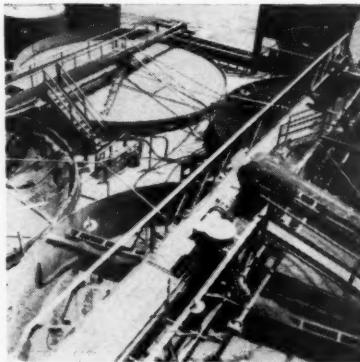
& Co., of San Francisco. Developed to a depth of 350 ft the mine reportedly contains about 500,000 tons of developed fluorspar. Diamond drilling by the U. S. Bureau of Mines in 1950 indicated that the deposits persist to greater depths. Leading producer of fluorspar in Nevada since 1932, the Baxter has been developed by five shafts, and three winzes.

## Gold Camp Takes Shape

Siskon Corp. is completing 25 prefabricated cabins and mine buildings at the Siskon gold mine, 20 miles north of Somes Bar, Calif., preparatory to installation of a ball mill. Veins exposed in surface workings vary in width from 20 to 100 ft and will be mined by the open-pit method. Siskon Corp. recently leased the mine on a long-term royalty basis.

## Largest Uranium Refining Mill

New facilities for treating uranium ores went into operation in October at the nation's largest uranium refining mill. The plant, owned and operated by United States Vanadium Co. at Uravan, Colo., has now been doubled in capacity as a result of an expansion program begun in August 1951. Walter E. Remmers, Vanadium president, in announcing that the larger facilities had been placed in



production, explained that the mill now incorporates a new method especially developed to process uranium ores with a high lime content.

Although high lime ores are fairly abundant in the region, they have never been mined to any great extent because lime increases the difficulty and cost of extracting the metals. The new installations are expected to overcome these problems. The expansion program at the Uravan mill, about 9½ miles south of Grand Junction, Colo., involved the building of a number of thickeners and solution tanks of about 40,000-gal capacity; new ore roasters; additional filtering equipment, and enlargement of the sampling plant. There are now eight mills on the plateau and two others are under construction.

## Stamp Mill Operating

Evans Brothers have placed their 10-stamp mill in operation at Virginia City, Nev. The mill is treating gold ore from the Bald Eagle mine near the south slope of Cedar Hill, also owned and operated by the brothers. The Bald Eagle is the only gold property now operating on the Comstock Lode.

## Test New Retort

A new demonstration-scale retort has been completed at the U. S. Bureau of Mines Oil Shale Demonstration plant and mine at Rifle, Colo., and is currently undergoing test. Built by the Blaw-Knox Construction Co., of Pittsburgh, the retort is patterned after a six-ton daily pilot plant. J. H. East, Jr., regional director in Denver, has said this unit has proved the "gas combustion" process is the most economical and efficient ever developed at Rifle. A series of dry runs are to be made before the new retort is fired and placed in operation on January 1, 1953. It has a capacity range of 150 to 400 tons of oil shale daily.

Objectives of the new plant are to determine cost and yield data that will permit an accurate evaluation of the gas combustion process; to provide crude shale oil in quantities needed to continue the Bureau's refining studies; and to provide the technical information industry will need to design commercial plants.

## Start New Mill Unit

Pend Oreille Mines and Metals Co. has recently started to operate its second new 800-ton milling unit at Metalline Falls, Wash. W. L. Ziegler, general manager, reports that testing and tuning up of the unit has been completed.

With the new unit on the line and completion of the second section of the underground ore conveyor system production of the mine can be boosted. The new conveyor section, 1200 ft long, extends down to the 1600-ft level, increasing the length of the inclined belt system to 2850 ft.

Shortage of experienced miners has put the company somewhat behind in its plans for its big east plant. When the first unit was put into operation around the first of 1951, it was planned to have the second unit going in the first half of this year, and the third unit ready by the last half of this year. Work on the proposed third unit is now in progress. A crusher ore bin for this unit is now about half completed. With its 600-ton Josephine or west mill, Pend Oreille eventually will have a milling capacity of 3000 tpd. It has a reserve of relatively low-grade zinc-lead ore blocked out in its east workings, believed to be one of the largest potential sources of these metals.



# Manufacturers Forum

## Using Wilmot Concentrator

Skubic Brothers of Virginia, Minn., report the initial installation in the Mesabi Range country of the new Wilmot-Daniels Heavy-Density concentrating system, recently introduced by Wilmot Engineering Co. of Hazleton, Pa. The plant, which will have a feed capacity of 175 long tons of ore per hour, includes a Roller ore concentrator. This newly developed separatory vessel features unidirectional medium flow and an unbroken flow of medium and float material at the weir. A standard drag-line conveyor, for lifting the concentrates out of the bath, is the only internal moving part in the unit.

## Improve Mine Communications

Farmers Engineering and Manufacturing Co. has announced the Femco Audiophone, an improved and simplified method of electronically



amplified voice communication for industry.

Femco Audiophones are offered as common talking systems, wired to order and consisting of press-to-talk, release-to-listen microphones and speakers at as many stations as are desired. Unless otherwise engineered to suit individual requirements for private two-way conversations, all stations hear simultaneously: directions, orders, warnings, or questions.

Power is drawn from 110, 60-cycle lines with simple plug-in attachments. Output ranges from 10 to 150 watts or more. By use of multiple amplifiers and boosters, extensive networks can be installed and coordinated.

With Femco Audiophone systems, men at the controls can be brought

within instantaneous voice contact with each other, even though they work at great distances apart.

Typical applications include steel mills, manufacturing plants, in mines—between levels and in processing operations, power generating plants and office—plant locations in light industry.

Femco Audiophones are manufactured exclusively by Farmers Engineering and Manufacturing Co. For additional information write the manufacturer at Irwin, Pa., requesting Bulletin No. 26. Copies are free on request.

## Shock Protection

The Star Fuse Co., Inc. announces the design and production of a modern fuse puller.

Featuring a toggle action for dou-

ble leverage and greater gripping strength, this new fuse puller enables electricians to safely pull fuses from the tightest clips without danger of slipping or twisting.

This unique fuse puller design also prevents fuses from slipping out of the



jaws when being replaced into the panel box.

The "Toggle Fuse Puller" is molded of tough attractive tenite. It is 7 1/4 in. long over-all, weighs 2 oz and fits all fuses up to 100 amp. It has a dielectric strength of 4000 v after 24 hr immersion in salt water.

## New Dragline

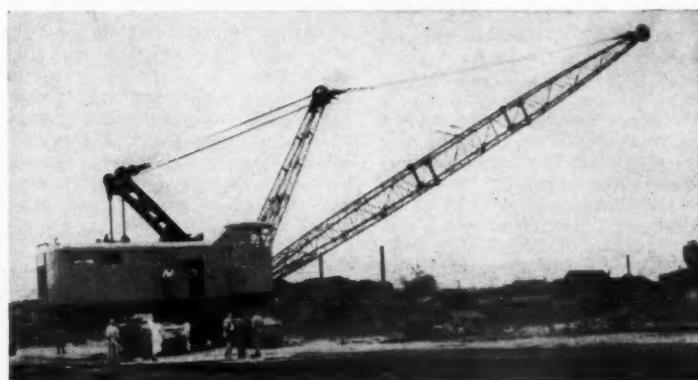
Harnischfeger's new Model 1855, reportedly the largest dragline ever mounted on a single pair of crawler frames, has been unveiled. Digging, hoisting, swinging and even propelling movements are governed by electromagnetic controls which have eliminated friction clutches entirely.

With magnetic pull instead of mechanical friction, these exclusive Magnetorque units transmit power without any mechanical linkage or wear. Their extreme ease and smoothness of operation means an absence of shock loads and an increase in daily output.

The heavy-duty dragline, designed

specifically to increase production and reduce operating costs, has a working weight of 600,000 lb and is capable of handling an eight-cu-yd bucket with a 120-ft boom or a seven-cu-yd bucket with a 150-ft boom. It is powered by an 8-cylinder Cooper-Bessemer FV8 diesel engine which develops 590 hp at 900 rpm. Traveling speed of the new low cost producer is 0.5 mph while its rotating speed reaches 3.54 rpm.

The first model already has been purchased for use in coal stripping operations at Sligo, Pa. Its purchaser was the Wingert Contracting Co. of Butler, Pa.

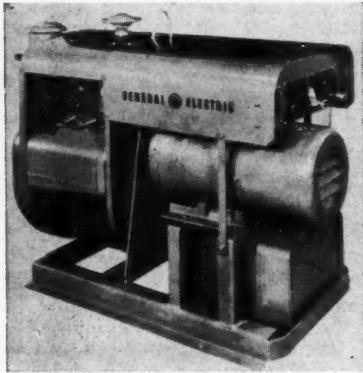


### Improve Maintenance

A new 200-amp, engine-driven d-c arc welder with a 60 percent duty cycle has been announced by the General Electric Co.'s Welding Department.

Designed as Type WD-42AGW, the new welder has a current range of 40 to 250 amp, and can be used with a variety of electrode sizes for repair, maintenance, and construction work.

Consisting basically of a G-E type WD42 generator and a Wisconsin air-cooled engine, it is designed to fit crosswise in a standard pick-up truck. Optional equipment includes a trailer



equipped with fittings for pressure lubrication.

Forced ventilation keeps internal temperature within safety limits when the welder is operated on a 60 percent duty cycle at rated load. In addition, tests indicate that heavy overloads for short periods do not produce harmful results.

Maintenance-wise, either the generator or engine can be removed easily for overhaul, and replaced by a standby unit. Since the engine is air cooled, coolants or anti-freezes are not required.

A vacuum-type device saves gasoline by idling the engine when welding is not being done.

Bulletin GEC-917, available from GE at Schenectady 5, N. Y., describes the welder more fully.

### Reduce Coal Dust

Coal brokers, users, and shippers who want clean, dust-free coal are being offered a new service by the Port Reading, N. J., Piers. The Reading Railroad Co. is making available to all shippers through these piers a special treatment to allay dust. The service is offered at no extra charge but must be specified on the order.

The treatment consists of spraying the coal prior to shipment with a special chemical solution known as Compound "M." This is a non-toxic and harmless preparation manufactured by Johnson-March Corp. of Philadelphia. The treatment in no way affects the burning qualities of the coal. It is said to eliminate more effectively the

annoyance of coal dust in shipment, handling, and storage. This method of treating coal to eliminate dust has been used successfully by many other coal-handling docks for the past five years.

### Drill Protection

Coal mining and rock drilling machinery, when equipped with Gortite, telescopic, accordion sleeves show appreciable savings on maintenance costs according to makers of the sleeve.

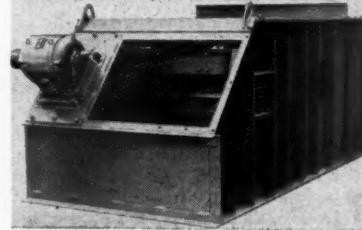
Fabricated to order, without mold charge, these sleeves can be engineered for numerous protective purposes. In recent Navy tests the flexible material of neoprene-nylon, by du Pont, showed no signs of cracking at temperatures as low as 45° F.

More about these products for indoor and outdoor machinery protection is told in a new bulletin AH-2. To obtain a copy write to A&A Manufacturing Co., 2017 West Clybourn Street, Milwaukee 3, Wis.

### Describe New Scalper

Production of the "SYMONS" Vibrating Rod Grizzly, a new high capacity unit designed to scalp in excess of 400 tons of material an hour, is announced by Nordberg Manufacturing Co., Milwaukee 1, Wis.

The new grizzly, designated type K-RG, is engineered and built for heavy-duty service in dry, wet, sticky or gummy rock and ore. Extensive



tests have substantiated the high capacity of the unit and several are now in successful operation in the field.

Applicable for separations from  $\frac{1}{2}$  in. upwards to about four in., the "SYMONS" Rod Grizzly is ideally suited for service following most sizes of primary crushers and for use ahead of secondary crushers. It serves primarily as a single cut scalping unit; however, it can accomplish a limited number of separations. A large feed intake opening and ample clearance between the power unit and the screen deck permits an unobstructed flow of material up to 12-in. feed size.

The "SYMONS" Vibrating Rod Grizzly, weighing 7500 lb, is 62 in. high at the feed end and 56 in. at the discharge end. It is 12 ft long and has a width of 68 $\frac{1}{2}$  in. The unit is furnished complete with V-belt drive and mounts for the 10-hp motor.

### Introduce New Lift Trucks

Two completely new fork lift truck models have just been released to industry, according to a recent announcement of the Hyster Co., Portland, Ore.; Peoria and Danville, Ill. They are an 8000-lb capacity truck and a 6000-lb capacity model. Both are gasoline-engine powered and mounted on pneumatic tires. Both in design and mechanical features, the trucks are refinements of the very latest in lift truck research and engineering.

Designed as an ideal "outside" truck, the "ZA-80" is the first heavy-duty 8000-lb industrial truck of its kind that can be operated efficiently indoors as well as out. Special at-



tion was given to operator comfort, ease of daily servicing and safety. Other outstanding features are shorter over-all length, longer wheelbase and better weight distribution than usually found in a truck of this size.

The "XA-60" model is a 6000-lb capacity version of the ZA-80 incorporating all the rugged heavy-duty features of the larger truck, but with shorter wheelbase, width and over-all length.

Descriptive literature can be obtained at any Hyster dealer or by writing to Hyster Co., 2902 N. E. Clackamas St., Portland 8, Ore.

### Announce New Hard Hat

A new type safety head covering, the Hard Boiled Cap, features lighter weight, more air space and exceptional impact resistance.

Although it has a lower crown than any other safety hat or cap, the air space between the hammock and crown is  $\frac{1}{4}$  in. in excess of the  $1\frac{1}{4}$  in. required by safety codes. This permits freer circulation of air and is consequently cooler for the wearer. The full-floating hammock and self-shaping sweatband also provide more comfort for the wearer because they distribute the light weight of the cap evenly over the entire head, according to the manufacturer. Hammocks can be slipped on in six seconds with wedge type fasteners that hold tight.

The Hard Boiled Cap which is distributed by Safety First Supply Co., Pittsburgh, is made in one size only that fits all heads. Headbands are quickly adjustable to head sizes from 6 $\frac{1}{2}$  to 7 $\frac{1}{2}$ . The brim of the cap is

shaped to form a raintrough. The crown is grooved along the top to hold the lamp wire in place; the raintrough serves the same purpose for lamps of other design.

Hard Boiled Cap No. 70-902 BR is accepted by Coal Mining Section of the Commonwealth of Pennsylvania.

### Protect Against Shock

A new portable mining machine cable which reduces the chance of shock hazard and arcing when a break occurs has just been developed for Anaconda Wire & Cable Co. by C. B. Peck, manager, Portable Cable Sales, after consultation with E. O. Jackson, general superintendent, and George K. Burnhart, master mechanic of Independent Coal & Coke Co. The new cable has successfully passed trials in the field and is offered for immediate use.

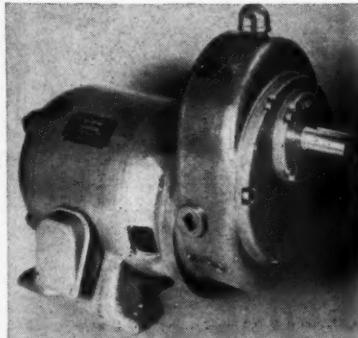
The purpose of this cable design is to cut off the power the instant damage occurs to the positive conductor insulation. The cable is used in conjunction with a ground trip relay which, when energized, shuts the power off. It is especially adaptable for use with shuttle cars and other mobile mining machines.

In addition to its safety features, the cable meets all the requirements of the Federal Mine Safety Code, Schedule 2E, of the U. S. Bureau of Mines, and Act No. 206 of the Commonwealth of Pennsylvania.

### Improve Mill Efficiency

A new Lifeline single-reduction garmotor (Type B) is available from the Westinghouse Electric Corp.

This garmotor meets the mounting limitation requirements peculiar to side entry agitators and mixers, and



is suitable for light duty coupled service applications such as fans and pumps. It is available in ratings from one to 30 hp, 780 to 420 rpm, AGMA Classes I and II.

By using reduction gears, garmotors have the advantage of being able to deliver power at speeds comparable to slow speed motors while utilizing smaller and more efficient high speed motors.

For further information, write

Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.

### Cut Construction Costs

Replacing the section of winding two-lane U. S. Highway 62 between Youngstown, Ohio, and Sharon, Pa., is a new four-lane superhighway that makes the old route look like a pioneer's wagon trail by comparison.

The project, covering a five-mile



stretch, cuts through two areas of concentrated sandrock. Double lane east and west roads, separated by a 40-ft dividing lane, are each 24 ft wide. Total width, including berm, is 120 ft.

An important factor in holding down costs are three McCarthy vertical drills manufactured by The Salem Tool Co., Salem, Ohio, and operated by the Apex Powder Co. As this project calls for deep cuts and fill, it is estimated that savings from using McCarthy vertical drills, in comparison to using air, well or churn drilling equipment, amount to about 20 percent.

### Announcements

G. V. Leece, vice-president and general sales manager of Gardner-Denver Co., has announced the appointment of Robert G. Caldwell as district manager of the company's branch office in Atlanta, Ga. Caldwell succeeds H. G. Little, former district manager of the Atlanta branch, and a member of the Gardner-Denver Co. since 1935.

John L. McCaffrey, president of International Harvester Co., has announced that Harvester acquired the stock of the Frank G. Hough Co. of Libertyville, Ill., manufacturers of earth-moving, excavating, and material handling equipment, on November 1.

Wallace M. Schleicher has been appointed general sales manager of the Edison Storage Battery Division of Thomas A. Edison, Inc., West Orange, N. J.

Morris F. Cunningham, vice-president in charge of sales, Goodman Manufacturing Co., has announced the appointment of William H. Carson as district manager of the company's Huntington, W. Va., sales office. He succeeds Morris W. Highland, granted a leave of absence for health reasons.

Frank E. Briber, Jr., has been named manager of Allis-Chalmers' newly formed Crushing, Milling and Mining Machinery Section, according to an announcement by G. V. Woody, manager of the company's Processing Machinery Department. Briber, who has been with Allis-Chalmers since 1946, was formerly manager of the crusher section.

W. C. Buchanan, chairman of the board of directors of Le Roi Co., Milwaukee, announced recently that E. O. Boshell, G. V. Meyers and J. Carlson have been elected directors of Le Roi Co.

Westinghouse Air Brake recently acquired a controlling interest in Le Roi through the purchase of a majority of Le Roi's common stock at \$9 per share.

### CATALOGS AND BULLETINS

**BRATTICE CLOTH.** *The American Brattice Cloth Corp., Warsaw, Ind.* This bulletin contains descriptions of seven kinds of brattice cloth used in mine ventilating and the particular merits of each type. Bulletin No. 952 is available upon request from the company.

**EARTH MOVERS.** *The Euclid Road Machinery Co., Cleveland 17, Ohio.* A revised catalog covering 13-cu yd Euclid Bottom-Dumps and Euclid Loaders, which provides the latest information and specifications on these models. The 16-page folder is available from Euclid distributors or the home office.

**EXPLOSION-PROOF MOTORS.** *The Louis Allis Co., Milwaukee 7, Wis.* A 12-page fully illustrated bulletin shows in detail the special features built into Louis Allis explosion-proof motors, and typical uses for these units. Included are many of the various electrical and mechanical modifications available. Copies of Bulletin No. 800 may be obtained from the company or from any of its district sales offices or distributors.

**SPROCKET WHEELS.** *Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill.* A catalog of over 200 sizes of cast tooth sprocket wheels available from stock. This eight-page Book, No. 2467, tells how to select stock sprocket wheels for prompt delivery, accurately fitted to the chain. A copy of Book 2467 will be sent to interested readers on request.

**STORAGE BATTERIES FOR MINE SERVICE.** *Edison Storage Battery Division of Thomas A. Edison, Inc., West Orange, N. J.* This booklet covers the advantages of using Edison nickel-iron alkaline storage batteries in mine-haulage equipment and is prepared to assist the reader in selecting the correct type of battery to meet his requirements.

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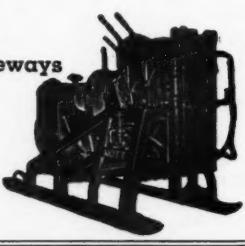
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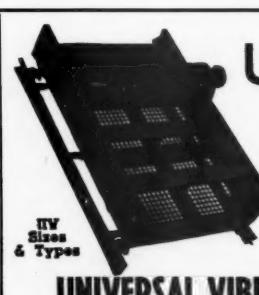
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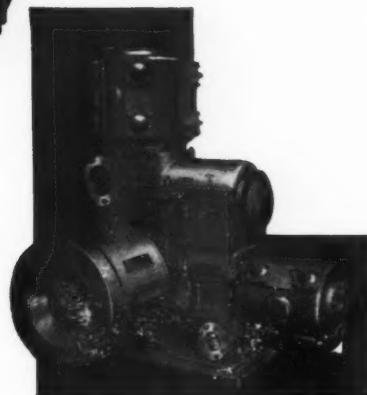
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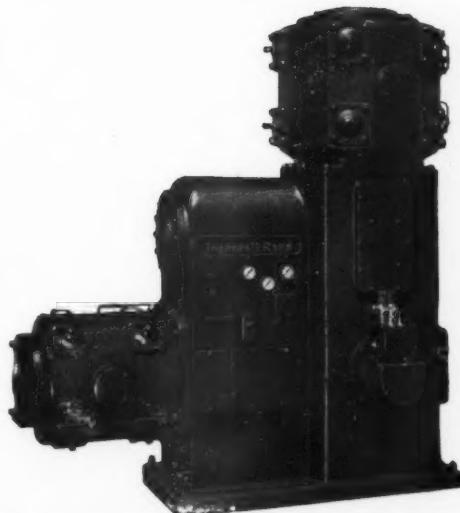
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